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NATIONAL COMMUNICATIONS FROM PARTIES INCLUDED IN ANNEX I TO THE CONVENTION

GUIDELINES FOR THE PREPARATION OF NATIONAL COMMUNICATIONS

Report on the workshop on methodological issues related to greenhouse gas inventories

Note by the secretariat

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I. INTRODUCTION

A. Mandate

1. The Subsidiary Body for Scientific and Technological Advice (SBSTA), at its eighth session, requested the secretariat to organize a workshop with the participation of methodological experts from the roster, as well as from other relevant organizations, to develop proposals to resolve the methodological issues identified by Parties and by the secretariat while processing greenhouse gas (GHG) inventories included in second national communications. The conclusions of such a workshop, and of any workshop organized by the secretariat related to possible additions and/or amendments to the revised guidelines for the preparation of national communications by Annex I Parties[1] (decision 9/CP.2), should be available for the tenth session of the SBSTA (FCCC/SBSTA/1998/6, para. 40 (d)).

2. The SBSTA, at its ninth session, took note of the information provided by the secretariat on the preparation of a workshop to resolve the methodological issues identified by Parties and by the secretariat while processing GHG inventories included in second national communications (FCCC/SBSTA/1998/7 and FCCC/SBSTA/1998/8). It decided that the options set by the secretariat and the initial information submitted by Parties could serve as a starting point for consideration at the workshop. The SBSTA invited Parties to submit initial information related to the options addressed in document FCCC/SBSTA/1998/8 by 1 December 1998 and additional information by 1 March 1999, for compilation into a miscellaneous document (FCCC/SBSTA/1998/9, para. 51 (g)).

3. At the same session, the SBSTA requested the secretariat to include the following topics on the agenda of the workshop, namely: methods, reporting and implications for the review process and procedures. It noted that one objective could be the identification of priorities for consideration by the Intergovernmental Panel on Climate Change (IPCC) task force on national GHG inventories (FCCC/SBSTA/1998/9, para. 51 (d)). The SBSTA requested the secretariat to prepare a report addressing clarifications, additions and amendments to the UNFCCC guidelines, particularly the GHG inventory section, taking into consideration information from workshops, for its tenth session (FCCC/SBSTA/1998/9, para. 51 (e)).

B. Scope of the note

4. This document is intended to respond only to the request of the SBSTA for a report on the workshop as noted in paragraph 1.

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[1] These guidelines are referred to as the UNFCCC guidelines in this report.

II. PROCEEDINGS AND DOCUMENTATION

5. As requested, the secretariat organized a workshop on methodological issues related to GHG inventories. The workshop was held in Bonn from 9 to 11 December 1998. The workshop focused on developing proposals to resolve the methodological issues identified by Parties and by the secretariat while processing GHG inventories included in second national communications (FCCC/SBSTA/1998/7 and FCCC/SBSTA/1998/8), including the analysis of the paragraphs of the inventory section of the UNFCCC guidelines. It also considered comparisons of GHG emission estimates using national and IPCC default methods. Furthermore, the participants were informed on the progress of the ongoing work of the IPCC-OECD-IEA Programme on National Greenhouse Gas Inventories.

6. In order to fulfil the mandate of the SBSTA (see paragraph 3 above), the workshop was split into three working groups, namely, methods, reporting and implications for the review process and procedures.

7. In total, 79 experts attended the workshop. Seventy-three of these were nominated by their respective governments as methodological experts to the roster. Forty-nine experts came from 27 Annex I Parties and 24 came from non-Annex I Parties. Two additional experts from non Annex I Parties were invited, but were not able to attend. In addition, six experts from four relevant intergovernmental organizations attended the workshop.

8. The workshop was chaired by the Chairman of the SBSTA, Mr. Kok Kee Chow (Malaysia). The working group on methods was co-chaired by Mr. J. Penman (United Kingdom of Great Britain and Northern Ireland) and Mr. A. Ajavon (Togo), the working group on reporting was co-chaired by Mr. I. Carruthers (Australia) and Mr. E. L. Rovere (Brazil) and the working group on implications for the review process and procedures was co-chaired by Mr. W. Hohenstein (United States of America) and Mr. R. Boer (Indonesia).

9. The Chairman of the SBSTA opened the workshop recalling the relevant mandates given by the SBSTA. Mr. Masaru Moriya, Secretary-General of the Institute for Global Environmental Strategies (IGES), informed the participants about plans for the Technical Support Unit to the IPCC National Greenhouse Gas Inventories Programme. Ms. Jan Corfee Morlot, Principal Administrator of the Environment Directorate of the Organisation for Economic and Co-operation and Development (OECD), made a presentation on: "Methods and reporting: linkage to issues of review and verification". Representatives of the IPCC-OECD-IEA Programme provided information on the ongoing work related to GHG inventories and presented the new software for the workbook of the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, referred to as the IPCC Guidelines in this note.

10. The secretariat gave an overview of GHG inventory data of second national communications and related analysis and presented two informal papers, namely:

(a) "Comparison of GHG inventories submitted by Parties using own national methodologies with those obtained using the IPCC default methodologies";

(b) "Effects of recalculations of the GHG inventories of the base and subsequent years on assigned amounts and on emission limitation and reduction commitments of Annex I Parties".

11. At the conclusion of the workshop the Chairman of the SBSTA requested the secretariat to make these informal papers available to all Parties. Revised versions of the above-mentioned papers are available as documents FCCC/SBSTA/1999/INF.2 and FCCC/SBSTA/1999/INF.3, respectively.

12. A third informal paper prepared by the secretariat, "Issues and suggestions related to the inventory section of the revised guidelines for the preparation of national communications by Parties included in Annex I to the Convention", was also used to facilitate the discussions of working groups. This paper identified language need in clarifying the inventory section of the UNFCCC guidelines and provided alternatives for consideration. The original issues and suggestions included in that informal paper are reproduced in annex I to this report for reference purposes only. Experts attending the workshop considered these issues and suggestions and made substantial contributions for the improvement of the inventory section of the guidelines. The informal paper also listed the relevant conclusions of the SBSTA and decisions of the Conference of the Parties (COP) adopted after decision 9/CP.2, which are reproduced in annex II to this note. Parties may wish to refer to the annexes when considering the draft of the inventory section referred to in paragraph 13 below.

13. A draft of the inventory section of the UNFCCC guidelines, incorporating clarifications, additions and amendments to this section, has been prepared based on the conclusions of the workshop and submissions from Parties. The draft text has been prepared to facilitate discussion at a workshop, with the participation of representatives from Parties, to be held in Bonn, from 17 to 19 March 1999. The draft text will be revised after this workshop and made available to Parties for consideration at the tenth session of the SBSTA. This draft text is reproduced as an addendum to the present document (FCCC/SBSTA/1999/INF.1/Add.1).

14. The conclusions of the workshop presented below were prepared by the secretariat integrating the individual conclusions of each working group into a single text. These individual conclusions were considered and generally accepted by the participants in plenary sessions during the workshop.

III. PRELIMINARY CONCLUSIONS OF THE WORKSHOP

15. The experts participating in the workshop reached a consensus on the following issues, with the exceptions noted below:

A. Options presented in document FCCC/SBSTA/1998/8[2]

16. **Use of different methods/data**

(a) Parties should be able to use different methods as long as they are consistent with the IPCC Guidelines and conform to any good practice standards which may be developed in the future;

(b) "Good practice" should be defined as follows:

(i) "Good practice" related to preparation of inventories should include information on methods used for calculations, the choice of emission factors and activity data;

(ii) "Good practice" related to inventory management should allow tracking and auditing of the information needed to estimate emissions and to identify where the responsibility lies for each step in the estimates. This might include formal quality assessment and quality control procedures using for example ISO 9000 as a basis but possibly extended to take account of the particular circumstances of emission inventories;

(iii) Good practice in verifying national inventories should include expert reviews and comparisons with relevant international data sources, and empirical data taking into account cost implications; and

(iv) Criteria for good practice should include transparency, completeness, comparability and consistency, and estimation of uncertainties, given that appropriate guidance is developed.

17. **Recalculation of the base year**

(a) Recalculations should be allowed, if they are necessary, consistent and transparent. Detailed criteria for allowing recalculation could include the following:

(i) The entire time series (including the base year) should be methodologically consistent. Recalculations should use activity data collected in a consistent manner;

(ii) Recalculations should improve the accuracy of the inventory, within the context of any agreed good practice guidelines;

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[2] The options discussed here correspond to paragraphs 18-30 of document FCCC/SBSTA/1998/8.

(iii) Recalculations should be fully transparent, that is all changes in data and calculation methods should be described; and

(iv) Recalculations should be subject to more detailed inventory review procedures than provided for under the present system.

18. Some additional criteria were discussed, but without reaching consensus:

(a) Recalculations should only be allowed for sectors other than carbon dioxide (CO_2) from fossil fuel combustion;

(b) Recalculations should only be allowed for a certain period of time;

(c) The direction of recalculations relative to commitments should be checked.

19. **Level of detail of the information as a function of the importance of different GHG emissions from various source categories; level of detail of information as a function of years; formats for presenting inventory data in a transparent way; supplementary information on methods, emission factors and activity data used for ensuring transparency**[3]

(a) The current guidelines have not resulted in transparent and comparable data from all Parties;

(b) Guidelines on reporting of GHG inventories should be separate from, but complementary to that for reporting of national communications;

(c) The reporting of national inventories should include the following types of information: common reporting format, complete national inventory and supplementary information.

20. The common reporting format should meet the principles of transparency, comparability and completeness, provide a basis for effective review and verification and be cost-effective. Guidelines should be developed to provide an improved common reporting format for emission estimates, which would ensure standardized summary reporting. It should summarize information from complete national inventories. The common reporting format should improve comparability between Parties' inventories, allow for improved handling of electronic submissions, provide a rapid assessment of the completeness and comprehensiveness of an inventory, and facilitate review and verification activities.

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[3] These four options were taken up as a group as they are interlinked.

(a) The common reporting format should include:

(i) The IPCC summary and sectoral tables for emission estimates, including modifications as appropriate;

(ii) Tables to report information on activity data and emission factors which underlie the emission estimates, as well as to give an indication of the methods used; and

(iii) The IPCC reference approach for CO_2 from fuel combustion, in addition to the results of the national approach (see paragraph 23 below) for comparison purposes. Similar comparisons could be developed for other sectors and greenhouse gases where possible.

21. There was agreement that a complete national inventory should give more detailed inventory data than provided for in the common reporting format. However, there was no consensus on what should constitute a complete national inventory to be provided under the Convention. Many experts said it should provide sufficient information to allow its reconstruction, including national activity data, emission factors and other assumptions in line with the current request under decision 9/CP.2. Other experts noted that a strict interpretation of this definition could involve very large amounts of data and, therefore, use of documentation standards (rather than full data transfer) could help to ensure access to appropriate information for less significant sources, taking into account both the size and the rate of change of the source. In addition, it was noted that a complete national inventory could include information on the methods used; references to sources of data; and other relevant assumptions and information. It could include an explanation as to why mandatory information was not reported and could also include information on national good practice procedures.

22. As part of achieving transparency in national GHG inventories of Annex I Parties, supplementary information should be made available to the secretariat by a certain date, which is to be decided by the Parties. Supplementary information could include explanation of methods, models, procedures, reference documentation, and information on national inventory systems, data collection and internal verification procedures. This information should be kept up to date in annual submissions. Parties should provide the national GHG inventory annually. Where Parties change their methods, data sources or assumptions, supplementary information should be updated to reflect this. As relevant, recalculations of parts of inventories as a result of changes in methods/data[4] should be provided (see paragraphs 17 and 18 above).

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[4] The term "methods/data" is used here in a broad sense. It refers to the methods, emission factors and assumptions related to use of the activity data used by Parties for estimating their GHG emissions.

23. **Comparison of estimates**

(a) Parties should be asked to report the IPCC reference approach for CO_2 from fuel combustion as a mandatory requirement for comparison with the national estimate, and explain any significant differences, as requested by the IPCC Guidelines;

(b) Parties should be encouraged to report comparisons for other significant greenhouse gas emissions, to the extent possible;

(c) The comparisons with international sources of data on emissions and activity data have a potential value for review purposes.[5]

24. **Reporting of CO_2 equivalent emissions**

(a) Reporting of a table containing aggregate emissions of the six groups of gases mentioned in the Kyoto Protocol expressed in CO_2 equivalents should be mandatory at a summary level[6] without substituting for gas-by-gas reporting;

(b) The guidelines should reflect decision 2/CP.3, which states that 1995 IPCC global warming potentials (GWPs) over a 100-year time horizon should be used. Other time horizons may not be necessary;

(c) For the synthetic gases, these GWPs should be applied to desegregated emissions, where available.

25. **Estimating and reporting of hydrofluorocarbon (HFC), perfluorocarbon (PFC) and sulphur hexafluoride (SF_6) emissions**

(a) The reporting of disaggregated data for sources and species of these gases should be mandatory;

(b) With regard to the affirmation in decision 2/CP.3 that actual emissions of HFCs, PFCs and SF_6 should be estimated, where data are available,[7] the current statistical difficulties and the scarce availability of data to estimate these emissions were noted.

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[5] Comparisons with international sources of data on emissions and activity data were not discussed at this workshop. Experts noted, however, the potential value of these comparisons and suggested that reporting requirements in this area should be reconsidered when the report requested by the Subsidiary Body for Implementation (SBI) at its ninth session (FCCC/SBI/1998/7, para. 21 (e)) becomes available at its tenth session.

[6] Experts agreed that the reference to summary level needs to be further defined.

[7] A discussion as to whether reporting of potential emissions should be mandatory for Parties not in a position to report actual figures, did not go beyond the conclusion of the fourth session of the SBSTA, which encourages these Parties to report potential emissions.

26. **Reporting of bunker emissions**

(a) Separate aviation and marine bunkers should be reported as set out in the IPCC Guidelines in a fully transparent manner. The lack of good activity data and the need for more work on collection of accurate bunker data constrains the reporting of emissions from bunkers according to the guidelines;

(b) A key element in the methodological work[8] is achieving a clear separation between domestic marine and aviation emissions (which are to be included in the national total), and international aviation and marine emissions (which are to be reported separately).

27. **Reporting of ozone precursors and sulphur dioxide (SO_2)**

(a) Current reporting of emissions of these gases should be continued. It was noted that many Parties report these emissions in other forums.

28. **Special needs of countries with economies in transition (EIT)**

(a) Although it was noted that identified data and institutional needs were not uniform among all EIT countries, several common problems exist. Among the identified problems were:

(i) Data availability for the base year;

(ii) Substantial changes since the base year including territorial changes;

(iii) Transition of the old statistical systems to other standards;

(iv) Lack of national emission factors; and

(v) Lack of a focal point to ask methodological questions related to inventories.

(b) Some proposed actions to overcome these problems included:

(i) Promoting the knowledge transfer related to good practice when preparing GHG inventories;

(ii) Creating a technical unit of advisers; and

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[8] The experts noted that as part of its ongoing methodological work, the secretariat is producing a separate paper related to bunker fuels which will be available at the tenth session of the SBSTA (FCCC/SBSTA/1999/INF.4).

(iii) Developing and organizing a network of EIT countries to assist each other and to increase capacity building.

29 **Uncertainty**

(a) It was noted that methodologies for estimating and reporting on uncertainties are currently under consideration by IPCC, following the request made by the SBSTA at its sixth session (FCCC/SBSTA/1997/6, para. 28 (b)). When this task is completed, additional information may be required by the SBSTA, depending on the advice given by the IPCC;

(b) Meanwhile, until such time as final guidance is adopted by the SBSTA, the experts felt that:

(i) Parties should be encouraged to report transparent information on uncertainties, including in both emission factors and underlying activity data. This information could be valuable, both to other Parties for comparative purposes, and as an input to the IPCC activity;

(ii) Quantifying uncertainties would be a useful means of prioritizing work needed to improve emission estimates, of increasing the usefulness of national inventories for scientific work, and of helping to justify the need for recalculations. In addition, it is possible that uncertainty data may be relevant to methodological work needed to implement the Kyoto Protocol.

B. Other issues and suggestions related to the inventories section of the UNFCCC guidelines[9]

30. **Base year**. The guidelines should be in line with the provisions of the Kyoto Protocol, which allow Parties to choose 1995 as a base year for HFC, PFC and SF_6 emissions.

31. **Uncertainty**. The revised UNFCCC guidelines need to clearly separate uncertainties related to inventories and those related to projections, due to their different characteristics.

32. **Background information**. The issue of background information provided by Parties in a language other than the working language of the secretariat should be considered at the SBSTA workshop with the participation of representatives from Parties, to be held in Bonn, 17-19 March 1999.

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[9] The headings of this section correspond to the main items of the inventories section of the UNFCCC guidelines. Paragraphs 4 to 9 of the "cross-cutting issues" section of the guidelines were also considered because they are related to inventories. Issues and suggestions related to each of these paragraphs were presented in the informal paper referred in paragraph 12 above. They are reproduced in annex I to this note.

33. **Information on new GHGs**. Parties should be encouraged to provide information about very new GHGs once identified.

34. **Adjustments.** The wording of the current guidelines should be revised according to the relevant conclusions of the SBSTA, namely, paragraph 53 of the report on the fourth session of the SBSTA (FCCC/SBSTA/1996/20)[10] and the last two sentences of paragraph 21 (b) of the report on the seventh session of the SBSTA (FCCC/SBSTA/1997/14).[11]

35. **Detailed information on feedstocks.** It was recalled that the UNFCCC guidelines should provide the principles, rather than technical detailed instructions.

36. **Indicators.** It was noted that the paragraph referring to indicators could be placed in the section on national circumstances.

37. The discussion of issues and suggestions[12] related to the use of GWPs, transparency, years to report, use of different methods, information to allow reconstruction of inventory, and bunkers was covered in the discussion on options set up by document FCCC/SBSTA/1998/8 (see paragraphs 15-29 above).

38. Information on sequestration and emissions of carbon in the land-use change and forestry sector was not discussed, in the light of the ongoing work by the IPCC and the SBSTA on methodological issues related to the estimation and reporting of emissions by sources and removals by sinks from that sector.

C. Review process and procedures

39. Experts discussed issues related only to the "review" of greenhouse gas inventories, not the broader issue of how national communications should be reviewed. Ways were considered to improve the review process, taking into account the evolving needs of the Convention, in the light of the Kyoto Protocol. There was general agreement that the existing GHG inventory review process needs to be improved as an inherent part of a technical process of ensuring high quality inventory data.

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[10] "The SBSTA stressed the necessity of reporting inventories in mass units without adjustments according to paragraph 12 of the annex to decision 9/CP.2. Adjustments are regarded as important information in relation to the monitoring of emission trends and the performance of policies and measures, and should be reported separately."

[11] "[For those purposes,] individual Parties may choose whether adjustments are applied, in addition to reporting unadjusted inventory data, and if so, which methods are chosen. The SBSTA encouraged Parties to share with others their experience with the application of adjustments."

[12] See footnote 9.

40. In addition to the mandate related to the workshop as set out in paragraphs 1 to 3 above, when discussing options for the review process, consideration was also given to relevant SBSTA and SBI conclusions and COP decisions. These include:

(a) Conclusions of the SBSTA at its ninth session, which invited Parties to submit information on, and the secretariat to prepare a report on, elements of a review process related to GHG inventories, including in-depth reviews (FCCC/SBSTA/1998/9, para. 51 (f));

(b) Conclusions of the SBI at its ninth session, which invited Parties to submit views on the scope and modalitites of the review process for third national communications including in-depth reviews, in the context of the Kyoto Protocol. Further, the secretariat was requested to prepare a document for the future review process, taking into account the views of Parties and the relevant requirements of the Kyoto Protocol (FCCC/SBI/1998/7, para. 21 (d));

(c) Decision 11/CP.4, which requests the subsidiary bodies to consider the scope, modalities and options for the review process, including the review of annual inventory information and the need for more thorough consideration of the national circumstances and reporting requirements under the Kyoto Protocol, with a view to adopting revised guidelines for the review process at the sixth session of the COP (FCCC/CP/1998/16/Add.1, decision 11/CP.4, para. 3).

41. Numerous ideas were put forth, but given the preliminary nature of the discussion, they should not be viewed as conclusive. The possible options to improve the review process were structured according to the following elements: pre-submission, submission and initial checks, synthesis and assessment report on inventories, and individual review of inventories.

1. Pre-submission

42. The experts discussed several options for internal national reviews, prior to submission of data to the UNFCCC secretariat, including the potential role of the national inventory authorities and other organizations in such a process. Initially, Parties could review their own inventory through comparisons with their previous submissions in order to pick up inconsistencies and potential errors. In this regard, Parties would need to archive all their previous submissions. They could also make improvements to their inventories by considering examples of best practice from other Parties, if such information was available. Guidelines for Parties to conduct internal reviews could, potentially, be provided by an international body such as the IPCC. External auditors could be involved at this stage of the review process. These might be national and/or international teams which could involve non-governmental experts. If such teams were to be established there could also be a certification process to ensure they meet appropriate standards. Parties may require some guidance on how to handle conflicting advice from external reviewers.

43. The experts noted that while internal reviews are to be encouraged, at this stage they should not be mandated; and currently there is no need for secretariat involvement in such processes.

2. Submission and initial checks

44. Experts agreed that the provision of a common reporting format to be submitted electronically would facilitate an improved review process. Furthermore, the group noted that the work of the IPCC on developing electronic computational tools may be of use. Experts also agreed that to facilitate a detailed review of inventories during the whole review process, Parties could be requested to indicate for each part of the inventory the source of underlying activity data and emission factors. This would make it easier for reviewers to request appropriate background material.

Checking procedure

45. As a first component of the review process, the group proposed an initial checking procedure of emission inventories, by the secretariat. At this stage, the main purpose would be to examine completeness and consistency in the data and supporting information. One option is to investigate the extent of adherence to the UNFCCC reporting guidelines. Previous submissions could also be used in the checking procedure to pick up potential anomalies. Beyond checking the basic availability and consistency of the data, the secretariat could also be asked to check aspects related to quality.[13]

46. The checking procedure should provide an opportunity for the secretariat to ask questions related to the inventory submissions. There could be an agreed timetable, following submission, during which the secretariat could provide such questions to individual Parties. Parties could then provide feedback to the secretariat within a fixed period such as 30 days.

47. Depending on the extent of the checking procedure envisaged, this may require a new mandate for the secretariat.

Status report

48. Based on the checking procedure, followed by the feedback by Parties, the secretariat could then release an initial report on the status of each submission. Drawing on the UNFCCC guidelines, potential elements of a status report could be: which gases have been included and at what level of disaggregation, for which years data are available, whether all sources have been reported, whether the submission was on time, whether the GWP values have been used correctly, whether the common reporting format has been submitted (by sector), whether the IPCC reference approach has been provided and whether supporting documentation has been

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[13] The option for the secretariat to check aspects related to quality was mentioned, but was not examined at the workshop.

provided etc. Such a status report, for each of the elements, could state where the UNFCCC guidelines indicate "should", "should to the extent possible", "are encouraged", "where available" or "may" etc. The status report could be posted on the World Wide Web.

3. Synthesis and assessment report on inventories

49. Experts agreed that while the current compilation of inventory data is valuable, there is a need for further analysis which could take the form of an annual synthesis and assessment report. This may require a new mandate for the secretariat.

50. At the synthesis and assessment stage, the main purpose of review would be to check for comparability, transparency and consistency of the inventory data. The focus of the report would be on cross-cutting issues and could identify issues common to groups of Parties. The secretariat could draw on the roster of experts in preparation of the report, including the assessment of generic issues. Different themes could be highlighted in different years. For example, the report could evaluate comparisons of emission factors including regional differences in defaults and provide this information to the IPCC inventory technical support unit.[14]

51. Where synthesis and assessment indicates issues, outliers and/or inconsistencies for a particular Party this information could be used in individual country reviews (see paragraphs 52-56 below), for example if emission factors differ considerably from those of other Parties with similar characteristics. In a year when supplementary information was available from the national communication, this could also be incorporated in the synthesis and assessment report. The synthesis and assessment report could adapt to the changing needs of the Parties as negotiations progress under the UNFCCC and the Kyoto Protocol.

4. Individual review of inventories

52. Currently reviews of individual country inventories occur only as part of the in-depth review of national communications. The group recognized the limitations of this existing process. In particular, the in-depth reviews of national communications generally only involve one inventory expert, inventory discussions last at most one day and preparatory work may not be sufficient.

53. Experts recognized that in addition to more detailed synthesis and assessment, the review of individual inventories needs to be enhanced. At this stage, individual reviews could serve to improve reliability, accuracy, and the quality of inventories for individual countries and identify the application of good practices on inventory preparation. Information from reviews could be used by Parties, the secretariat, the IPCC and other bodies to build capacity and improve methodologies. The experts discussed three basic options:

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[14] The secretariat notes that it currently undertakes these types of analyses of GHG data, i.e. synthesis and assessments, under its mandates related to methodological issues. Its mandate related to compilation and synthesis of national communications is less expansive.

(a) Firstly, individual reviews of national inventories could be conducted annually. These could vary over time in scope so they may be more in-depth some years than others;

(b) Secondly, individual reviews could be conducted on a less frequent basis, perhaps prior to when the in-depth reviews are due to be conducted; and

(c) Thirdly, individual reviews of inventories could occur at a set period, for example, every three to four years.

54. Reviews could be conducted either by sending inventory materials to experts in a single location or through a series of country visits involving experts. The teams of experts could be drawn from the roster and intergovernmental organizations (IGOs), perhaps divided up by gas, source and sector, according to expertise. Another option would be to link individual reviews to the in-depth reviews or hold them separately. In the case of annual reviews, it might be possible to tie in review of individual inventories with the synthesis and assessment report of the inventory data.

55. There are several possible elements related to individual country reviews. The review team could attempt to replicate parts of the inventory, prior to a visit. There could be a list of questions that are asked for every aspect of an inventory. There could be prioritization of which aspects are reviewed in-depth and this could change for each review. The uncertainty associated with emissions from particular sources could be taken into account in deciding whether a particular source should be considered in-depth. There could be data comparison[15] with other international organizations. There could be consideration of whether good practices are in place.

56. There could be instructions/guidelines for review and an agreed review structure to ensure consistency across national reviews. There could be orientation for experts at the secretariat, for example, prior to the reviews. Furthermore, a minimum standard of qualification may be required.

D. Other issues

57. The experts considered the relationship between revision to the guidelines and development of national systems as required under the Kyoto Protocol. It was noted that present revisions may build a foundation for the level of documentation that will be needed for a national system.

58. It was noted that confidentiality could be an issue that may arise in some circumstances with respect to reporting information of GHG emissions of different gases in different sectors at certain levels of disaggregation.

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[15] See footnote 5.

59. It may be necessary to include a glossary of key terms (transparency, consistency, comparability, good practices, etc.) in the guidelines.

60. The experts identified several tasks which could be carried out by the IPCC. The experts:

(a) Noted the current statistical difficulties and the scarcity of data for estimating and reporting HFC, PFC and SF_6 emissions, and identified this as an issue for the relevant IPCC inventory workshop on better practice inventory methods;

(b) Suggested that the IPCC could identify additional new GHGs once they appear;

(c) Suggested that the issue of providing proxies for any missing base year data in EIT countries should be addressed under the IPCC-OECD-IEA Inventories Programme;

(d) Suggested that the issue of providing detailed information on feedstocks could be handled over to sectorial experts of the IPCC Inventories Programme for further discussion;

(e) Noted the importance of quality assurance and quality control procedures in preparation of national GHG inventories and that consideration of such procedures is included in the IPCC-OECD-IEA Inventories Programme.

61. The experts requested improving the links and sharing of information and data between the secretariat and the IPCC. They also considered that an enhanced review process of the inventory data by the secretariat and the SBSTA may facilitate the sharing of this information with the IPCC.

IV. SUGGESTIONS FOR TASKS TO BE CARRIED OUT BY THE SECRETARIAT[16]

62. The experts suggested that the secretariat begin the preparation of a common reporting format for reporting and submitting the official national inventory data and that this should be done in consultation with the IPCC-OECD-IEA Inventories Programme. Experts further noted that it would be useful to have a draft available for the UNFCCC workshop with participation of representatives from Parties to be held in Bonn, from 17 to 19 March 1999.

63. The experts agreed that the informal paper entitled "Comparison of GHG inventories submitted by Parties using own national methodologies with those obtained using the IPCC default methodologies" is a useful contribution to the work on methodological issues related to GHG inventories. They encouraged the secretariat to circulate the paper to the roster of experts

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[16] The experts identified several tasks that could be carried out by the secretariat if resources are available. They are grouped together in this section of the report to facilitate possible further action by the SBSTA.

to get feedback and include it in secretariat documents to be prepared for consideration by the SBSTA, at its tenth session.[17]

64. Given that the preliminary work by the secretariat on "Effects of recalculations of the GHG inventories of the base and subsequent years on assigned amounts and on emission limitation and reduction commitments of Annex I Parties"[18] and by Parties indicates that recalculation can affect significantly the estimation of the assigned amount, and the way in which commitments will be met under the Kyoto Protocol, the experts suggested that this issue deserves more study by the secretariat and the Parties.

65. The experts suggested that the SBSTA consider the common technical problems of EIT countries. They also suggested the secretariat prepare a detailed assessment of each Party's needs related to these problems which have emerged from the analysis of the national communications already available and in-depth reviews to be conducted.

66. The experts suggested that the secretariat could further facilitate access to inventory data by the general public by providing improved access to data for on-line searches by gas, source, year, country etc. Improving data access in this way would not require a new mandate for the secretariat.

67. The experts also suggested that the secretariat could draw up a proposal on processes for the handling of confidential data and make it available for the consideration of the SBSTA.

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[17] Document FCCC/SBSTA/1999/INF.2.

[18] Document FCCC/SBSTA/1999/INF. 3 (cf. paragraph 11 above).

Annex I

ORIGINAL ISSUES AND SUGGESTIONS PREPARED FOR THE WORKSHOP

1. The paragraphs below refer to specific sections in the UNFCCC revised guidelines for the preparation of national communications by Parties included in Annex I to the Convention (decision 9/CP.2) with cross-references to subsequent COP decisions and SBSTA conclusions. Quoted text of the guidelines is presented in *italics* followed by issues and suggestions.

2. Paragraph 4:[1]

> *Quantitative data related to inventories and projections of greenhouse gas emissions and removals should be presented on a gas-by-gas basis in units of mass (Gg) with emissions by sources listed separately from removals by sinks, except in cases where it is technically impossible to separate information on sources and sinks in the area of land-use change and forestry.*

The content of this paragraph is clearly defined and may not need further revision.

3. Paragraph 5:

> *In addition to communicating emissions in units of mass, Parties may choose also to use global warming potentials (GWPs) to reflect their inventories and projections in carbon dioxide-equivalent terms, using information provided by the Intergovernmental Panel on Climate Change (IPCC) in its Second Assessment Report. Any use of GWPs should be based on the effects of the greenhouse gases over a 100-year time horizon. In addition, Parties may also use other time horizons.*

Issues	Suggestions
The reporting of estimates in terms of aggregate GHG emissions expressed in terms of CO_2 equivalent is currently optional. (See also annex II, para. 9(3))	The additional and mandatory reporting of aggregate GHG estimates in terms of CO_2 equivalent using IPCC 1995 GWPs with a 100-year time horizon (decision 2/CP.3) could be required. This should not substitute the reporting of individual GHGs on a gas-by-gas basis in mass units.
It is optional to also report using GWP values with other time horizons.	The reporting of other time horizons may not be necessary. Guidance may be needed on how to report emissions on a sectoral/national level, as well on the reporting formats.

[1] Paragraphs 4 to 9 are listed in the UNFCCC guidelines under the heading "Cross-cutting issues". Since they contain relevant information related to GHG inventories, they are considered in this note.

4. Paragraph 6:

Taking into account the provisions of Article 4.2(b), the year 1990 should be the base year for inventories.[2] *The provisions of Article 4.6 are relevant in this context for the Parties included in Annex I undergoing transition to a market economy, and those Parties in their communications should propose to the Conference of the Parties the of flexibility they are seeking pursuant to that Article.*

This paragraph may not need further revision, but it could be updated by dropping the referen to the Intergovernmental Negotiating Committee.

5. Paragraph 7:

The transparency of national communications is fundamental to the success of the process for the communication and consideration of information. This transparency particularly important for inventories of emissions and removals of greenhouse gases and for projections and assessments of the effects of measures.

Issues	Suggestions
The paragraph highlights the importance of transparency for the reporting of inventories in the context of the Convention	It may be necessary to mention other important attributes of inventories in other paragraphs, such as consistency, comparability, completeness, and accuracy.

6. Paragraph 8:

When national communications present quantitative data related to inventories and projections of greenhouse gas emission and removal levels, the level of uncertainty associated with these data and underlying assumptions should be discussed qualitativ and, where possible, quantitatively.

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[2] In accordance with the decisions of the Intergovernmental Negotiating Committee for a Framework Conven on Climate Change at its eighth session.

Issues	Suggestions
The paragraph is not precise.	It may be useful to request the IPCC overview table. This is also important to ensure completeness in reporting of national GHG inventories. The provision of specific additional information by Parties could be encouraged while the SBSTA considers the outcome of the ongoing work of the IPCC-OECD-IEA Inventories Programme on uncertainties and "good practices". Some additions to the guidelines may be expected following consideration of the above-mentioned work by the SBSTA.

7. Paragraph 9:

Parties should provide additional relevant background information to the secretariat, if possible, but not necessarily, in a working language of the secretariat. Such information should include documentation on emission factors used, activity data, and other relevant assumptions, as well as technical reports on the projections analysis.

Issues	Suggestions
This question relates directly to the inventories/projections section of the UNFCCC guidelines, but is currently included under "cross-cutting issues". The information required for inventories and projections may be different.	This question could be covered in the respective inventories/projections sections, and not under "cross-cutting issues".
Many Parties do not provide the appropriate background information. The scope of the background information varies among Parties.	The basic and supplementary background information to be provided regarding emission factors, activity data and other assumptions should be precisely defined. This could differ for gases and source categories.
The term "relevant assumptions" is not well defined in the guidelines.	Guidance on formats (IPCC standard tables, worksheets, other forms) to provide the information.

8. Paragraph 11:[3]

Article 12.1(a) requires that communications include a national inventory of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol. At a minimum, information should be provided on the following greenhouse gases: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), and sulphur hexafluoride (SF_6). Parties should also provide information on the indirect greenhouse gases carbon monoxide (CO), nitrogen oxides (NO_x) and non-methane volatile organic compounds (NMVOCs), and are encouraged to provide data on sulphur oxides. As new gases with significant global warming potentials are identified, they should be included in the communications. Where methodological or data gaps exist, information should be presented in a transparent manner.

Issues	Suggestions
The current reporting of HFC, PFC and SF_6 emissions is inconsistent and incomplete.	Guidelines on how to report HFCs, PFCs and SF_6 (actual/potential emissions or both; disaggregated by substance) are necessary. All COP decisions and SBSTA conclusions need to be integrated into consistent guidance.
Additional guidance on how to report these emissions was given by the SBSTA (see annex II, para. 3) and the COP (see annex II, para. 9(2)).	Specific formats could be developed to provide this information. The reporting of these gases may deserve an independent paragraph in the guidelines.
The reporting of SO_2 is optional.	Inconsistencies in providing information among Parties may be avoided by being more specific or omitting optional requirements.
The guidance on how to present data on new gases with significant GWPs is not specific enough.	A definition of "significant" is needed, as well as guidance on how to include these data in reporting tables.
The guidance on how to present data gaps is not sufficiently specific.	A set of definitions on how to report gaps in the data (not occurring, not estimated, not available) may be useful to ensure consistency and transparency.

9. Paragraph 12:

If Parties carry out any adjustments to inventory data, for example for climate variations or trade patterns in electricity, these adjustments should be reported in a transparent manner, with clear indications of the method followed. Both adjusted and unadjusted data should be provided.

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[3] Paragraphs 11 to 19 are those included in the UNFCCC guidelines under the heading "Inventories".

Issues	Suggestions
Both adjusted and unadjusted data are given the same importance in this paragraph (see annex II, paras. 3, 7, 8)	The text needs to be consistent with the SBSTA conclusions. It may be necessary to highlight that inventories have to be reported in mass units without adjustments and that adjustments should be reported separately, according to the relevant conclusions of the SBSTA (see annex II, para. 4).

10. Paragraph 13:

Parties should also provide greenhouse gas inventory information for years subsequent to 1990. Data should be provided for each year (where appropriate, updated) for the period 1990-1994 and, where available, for 1995, for the second national communication. Subsequent national communications should provide data from 1990 and up to three years prior to the submission year, and, if possible, later years. If possible, data should also be provided in an electronic version which is compatible with the requirements of the secretariat.

Issues	Suggestions
This language is outdated and overtaken by subsequent COP decisions and SBSTA conclusions (see annex II, paras. 6, 16).	The language should be made consistent with subsequent COP decisions and SBSTA conclusions.

11. Paragraph 14:

The IPCC Guidelines for National Greenhouse Gas Inventories should be used in estimating, reporting and verifying inventory data. These inventory guidelines offer a default methodology available to any country that wishes to use it. Countries that already have an established and comparable methodology could continue to use that methodology, provided that they include sufficient documentation to back up the data presented. For Parties using the CORINAIR methodology or other "bottom-up" approaches, this would entail providing activity data and disaggregated emission factors as well as details of the correspondence between the IPCC source categories and those of the CORINAIR or other "bottom-up" approach used. Standard tables and formats recommended in the IPCC Guidelines for National Greenhouse Gas Inventories should be used for presentation of data.

Issues	Suggestions
The IPCC Guidelines allow great flexibility to use other compatible methodologies, different tiers and emission factors.	A specific description of how the IPCC Guidelines have been used may need to be requested. This description may also be necessary for Parties which use national methods for estimating their inventories.
The requested documentation from Parties that use CORINAIR or other bottom-up approaches for estimating their GHG inventories is difficult to process. The information is generally not provided by many Parties.	It may be necessary to define what is the corresponding information necessary to ensure transparency that Parties using CORINAIR or other bottom-up methods should provide. The level of information requested should be similar for all reporting Parties. This may imply an agreement on a common reporting framework for basic and supplementary information (also in electronic formats).
IPCC standard data tables have been used by many Parties for the presentation of data, but in the IPCC Guidelines, the format has changed to "sectoral tables". Almost no Party provided the worksheets they used to estimate GHG emissions. If available, these worksheets provide more information than the IPCC standard data tables. However, it seems difficult for Parties to provide worksheets for most sectors.	It may be necessary to define for what sectors/gases worksheets or IPCC standard data tables should be requested.
The IPCC standard data tables require information on activity data used and aggregate emission factors that the sectoral tables do not provide. Parties which provided these tables presented a more transparent inventory.	If mandatory use of the IPCC standard data tables is agreed upon, it may be necessary to request the IPCC to develop such tables for the new or revised sectors of the IPCC Guidelines.

12. Paragraph 15:

With regard to possible double counting or non-counting of emissions, Parties should provide a brief description of how feedstocks have been considered in the industrial processes source category of the inventory, in particular in the production of iron and steel and non-ferrous metals, and in the chemical and petro-chemical industry. Parties should also provide a brief explanation of the way in which CO_2 emissions in the waste source category have been considered, in particular indicating whether the IPCC methodology has been followed in excluding CO_2 emissions from organic waste combustion or aerobic decomposition of biogenic products and including emissions from fossil-fuel based products (plastics and hydrocarbons).

Issues	Suggestions
No precise guidance on how to report feedstocks is given. Generally, the current guidance is not followed by most Parties.	Clearer guidance on the reporting of feedstocks may be necessary or this requirement may need to be deleted.
Feedstocks are either reported in industrial processes or in fuel combustion. The allocation of feedstock emissions and the way in which they are estimated are not reported in a transparent way. This could induce double counting and non-counting of emissions.	Guidance on formats to provide the required information on feedstocks may be necessary.
The distinction between CO_2 emissions from organic and fossil-fuel based products is often not made.	Very specific information is requested for a relatively insignificant source. This request may not be necessary, as it could be covered by a more precise reporting of feedstocks.

13. Paragraph 16:

To ensure transparency, enough information should be provided to allow the reconstruction of the inventory from national activity data, emission factors and other assumptions, and to assess the results. Annex I Parties should follow the IPCC Guidelines for National Greenhouse Gas Inventories with respect to the presentation of methodologies, activity data, emission factors and other assumptions. Standard data tables do not provide the level of detail necessary to enable the reconstruction of an inventory. In this connection, IPCC worksheet 1.1, or other equivalent documentation, indicating the assumptions used to estimate CO_2 emissions from fuel combustion, in line with the IPCC Reference Approach, should be provided.

Issues	Suggestions
The IPCC Guidelines do not give clear guidance on how to present information on methodologies, activity data, emission factors, etc.	See suggestions in paragraphs 11 and 15, above in this annex.
Only some Parties submitted IPCC worksheets or similar information for CO_2 emissions from fuel combustion. In addition, the IPCC Guidelines request the comparison of national CO_2 fuel combustion estimates with those obtained with the IPCC Reference Approach.	The IPCC request for the comparison of estimates for self-verification purposes could be included explicitly in the UNFCCC guidelines. The request to submit worksheets for estimates of CO_2 emissions from fuel combustion by the IPCC Reference Approach could be strengthened. The submission of all IPCC worksheets could be necessary, since worksheet 1.1 only covers information on CO_2 emissions from fuel combustion.

14. Paragraph 17:

In providing information on emissions from international aviation and marine bunker fuels, and in accordance with the IPCC Guidelines for National Greenhouse Gas Inventories, Parties should include such data, in a separate category, in their inventories of emissions on the basis of fuel sold and should, as far as possible, not include them in total national emissions.

Issues	Suggestions
The reporting of bunkers is not consistent among Parties. Some Parties do not report bunkers separately from other fuel combustion emissions.	More precise reporting requirements may be needed, such as more detailed information on methods used to estimate bunker emissions and the quantity of fuel sold to bunkers.
See also relevant conclusions of the SBSTA (see annex II, para. 5) and decisions of the COP (see annex II, para. 9(4)).	All decisions and conclusions need to be integrated into consistent guidance.

15. Paragraph 18:

If Parties wish in addition to present their inventory data in other forms, inter alia, greenhouse gas emissions per capita, this information could be provided in a section of the national communication dealing with basic data (national circumstances). If possible, it would also be desirable to include some information on historical trends (for example, emissions and removals over the period 1970 -1990) so as to put the inventory information in context.

Issues	Suggestions
The content of this paragraph is not directly referring to the use of the inventories for meeting commitments of the Convention or the Kyoto Protocol.	This paragraph could be included in another section of the guidelines, such as national circumstances.

16. Paragraph 19:

In providing information on sequestration and emissions of carbon in the land-use change and forestry sector, as well as in agricultural soils, Parties should provide the information in the worksheets provided in the IPCC Guidelines for National Inventories, or equivalent documentation. Emissions of other greenhouse gases associated with these activities should also be listed, as appropriate. Historical trends should be included where available. Even if Parties do not use the IPCC default methodology, the results should be presented using the IPCC reporting format.

Issues	Suggestions
There has been inconsistent reporting in the land-use change and forestry and agricultural soils sectors.	The outcome of the ongoing methodological work by the IPCC related to land-use, land-use change and forestry will be considered by the SBSTA as per decisions taken by the COP at its fourth session. Additional guidance may be needed at a later date. In spite of the diversity of existing methods to estimate these emissions, Parties could be urged to report emissions/removals from land-use change and forestry and agricultural soils using the IPCC reporting format.

Annex II

OTHER RELEVANT DECISIONS OF THE CONFERENCE OF THE PARTIES AND CONCLUSIONS OF THE SBSTA

1. The following paragraphs cite relevant decisions of the COP and conclusions of the SBSTA adopted subsequent to decision 9/CP.2. They are directly related to the reporting of GHG emission inventories. Some are of a general nature and some give precise instruction on reporting emission inventories. Procedural decisions and conclusions are not included. The relevant decisions and conclusions are listed in chronological order. The corresponding quoted paragraphs of the COP decisions and SBSTA conclusions are presented in parentheses.

Report of the SBSTA on its fourth session (FCCC/SBSTA/1996/20)

2. The SBSTA took note of the Revised 1996 Guidelines adopted by the IPCC for the reporting of national greenhouse gas inventory data, and decided that the Revised 1996 Guidelines should be applied by Annex I Parties on a voluntary basis for the inventories due in 1997 and on a mandatory basis for inventories due in 1998 and beyond. When applying the Revised 1996 Guidelines, these Parties should also use them to recalculate the base year greenhouse gas inventory. Annex I Parties are urged to submit updated time series data for the years in between. In providing greenhouse gas inventories due in the years 1997 and 1998, Annex I Parties should indicate clearly whether they use the 1995 Guidelines or the Revised 1996 Guidelines. Annex I Parties with economies in transition may phase in the Revised 1996 Guidelines one year later than other Annex I Parties, but not later than for the inventories due in 1999, at which time they should also recalculate their base year inventory and inventories for the years in between to the extent possible (FCCC/SBSTA1996/20, para. 30 (a));

3. The SBSTA encouraged Parties to report actual emissions of HFCs, PFCs and SF_6, given that these better reflect the real releases to the atmosphere and encouraged Parties which are not in a position to report actual figures to report potential emissions. Parties which report actual emissions should also include figures for potential emissions as a subset, for reasons of transparency and comparability (FCCC/SBSTA1996/20, para. 31).

4. The SBSTA stressed the necessity of reporting inventories in mass units without adjustments according to paragraph 12 of the annex to decision 9/CP.2. Adjustments are regarded as important information in relation to the monitoring of emission trends and the performance of policies and measures, and should be reported separately (FCCC/SBSTA1996/20, para. 53).

5. The SBSTA noted that there are three separate issues related to international bunker fuels: adequate and consistent inventories, allocation of emissions and control options. Appropriate allocation of responsibility for emissions from international bunker fuels would be connected to inventory and control issues. The SBSTA noted that eight options for allocation of bunker fuels were suggested in document FCCC/SBSTA/1996/9/Add.1, and considered that

options 1, 3, 4, 5 and 6 should be the basis for its further work on the issue. With respect to option 1, it should be considered to recognize the responsibilities of the international community to address issues related to international bunker fuels. The SBSTA took note of the work of the International Civil Aviation Organization (ICAO), as well as the work of the Annex I expert group on policies and measures to address these emissions. The SBSTA noted the role of ICAO and the International Maritime Organization (IMO) in addressing the control of international bunker fuel emissions, and the opportunity for Parties to work through these bodies. The SBSTA encouraged Parties to report emissions from international aviation and marine bunker fuels as two separate entries in their national communications, in accordance with the Revised 1996 IPCC Guidelines (FCCC/SBSTA/1996/20, para. 55).

Report of the SBSTA on its seventh session (FCCC/SBSTA/1997/14)

6. The SBSTA recalled decision 9/CP.2, requesting Annex I Parties to submit their national inventory data on an annual basis by 15 April of each year. In addition, the SBSTA invited Annex I Parties to make available to the secretariat by 6 June 1998, for purposes of comparison and transparency, their complete 1996 GHG inventories obtained using, when possible, best available methodologies and those obtained using the current IPCC default methodologies. The SBSTA requested the secretariat to draw upon the roster of experts to analyse and compare the results and assess the adequacy of information and the implications for meeting emissions limitation or reduction objectives, and to make them available for its ninth session (FCCC/SBSTA/1997/14, para. 16 (b)).

7. The SBSTA recalled decision 9/CP.2, which states that if Parties carry out any adjustments to inventory data, for example for climate variations or trade patterns in electricity, these adjustments should be reported in a transparent manner, with a clear indication of the method followed. Both adjusted and unadjusted data should be provided. The SBSTA also recalled that, at its fourth session, it had stressed the necessity of reporting inventories in mass units without adjustments, according to the guidelines, and had concluded that adjustments were to be regarded as important information in relation to the monitoring of emission trends and the performance of policies and measures, and should be reported separately (FCCC/SBSTA/1997/14, para. 21 (a)).

8. On the basis of the information in document FCCC/SBSTA/1997/9, the SBSTA further concluded that weather adjustments, in particular temperature adjustments, to national GHG inventories and projections might be a useful tool to understand the factors influencing emissions and to assess the effectiveness of policies and measures. For those purposes, individual Parties may choose whether adjustments are applied, in addition to reporting unadjusted inventory data, and, if so, which methods are chosen. The SBSTA encouraged Parties to share with others their experiences with the application of adjustments (FCCC/SBSTA/1997/14, para. 21 (b)).

Report of the COP on its third session (FCCC/CP/1997/7/Add.1)

9. Decision 2/CP.3:

"*The Conference of the Parties*,

...

1. *Reaffirms* that Parties should use the Revised 1996 Guidelines for National Greenhouse Gas Inventories of the Intergovernmental Panel on Climate Change to estimate and report on anthropogenic emissions by sources and removals by sinks of greenhouse gases not controlled by the Montreal Protocol;

2. *Affirms* that the actual emissions of hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride should be estimated, where data are available, and used for the reporting of emissions. Parties should make every effort to develop the necessary sources of data ;

3. *Reaffirms* that global warming potentials used by Parties should be those provided by the Intergovernmental Panel on Climate Change in its Second Assessment Report ("1995 IPCC GWP values") based on the effects of the greenhouse gases over a 100-year time horizon, taking into account the inherent and complicated uncertainties involved in global warming potential estimates. In addition, for information purposes only, Parties may also use another time horizon, as provided in the Second Assessment Report;

4. *Recalls* that, under the Revised 1996 Guidelines for National Greenhouse Gas Inventories of the Intergovernmental Panel on Climate Change, emissions based upon fuel sold to ships or aircraft engaged in international transport should not be included in national totals, but reported separately; and urges the Subsidiary Body for Scientific and Technological Advice to further elaborate on the inclusion of these emissions in the overall greenhouse gas inventories of Parties;

5. *Decides* that emissions resulting from multilateral operations pursuant to the Charter of the United Nations shall not be included in national totals, but reported separately; other emissions related to operations shall be included in the national emissions totals of one or more Parties involved."

Report of the SBSTA on its eighth session (FCCC/SBSTA/1998/6)

10. The SBSTA noted that the Kyoto Protocol includes provisions related to GHG inventory methods. The SBSTA recognized that methodological issues arising from the Protocol including, for example, guidance for estimating and reporting HFCs, perfluorocarbons and sulphur hexafluoride, need to be evaluated. The SBSTA encouraged the IPCC-OECD-IEA Inventories Programme to give high priority to completing its work on uncertainty, as well as to prepare a report on good practices in inventory management and to submit a report on these issues for consideration by the SBSTA, if possible by COP 5. The SBSTA encouraged the

secretariat to continue its close collaboration with other relevant bodies, such as the Technology and Economic Assessment Panel of the Montreal Protocol, on technical and methodological issues (FCCC/SBSTA/1998/6, para. 40 (e)).

Report of the SBSTA on its ninth session (FCCC/SBSTA/1998/9)

11. The SBSTA requested the secretariat to prepare a report, which addresses clarifications, additions and amendments to the revised guidelines for the preparation of national communications by Annex I Parties (decision 9/CP.2), particularly the GHG inventory section, taking into consideration information from both workshops, for its tenth session. (FCCC/SBSTA/1998/9, para. 51 (e)).

12. The SBSTA requested the secretariat to prepare an initial report on elements of a review process related to GHG inventories, including in-depth reviews, based on the issues identified at both workshops and submissions from Parties, for consideration at its tenth session, with a view to forwarding relevant information to the SBI. The SBSTA invited Parties to submit information related to elements of a review process by 1 March 1999 (FCCC/SBSTA/1998/9, para. 51 (f)).

13. The SBSTA requested the secretariat to provide information to the SBSTA, at its tenth session, on emissions resulting from fuel sold to ships or aircraft engaged in international transport, taking into account the ongoing work of the International Maritime Organization (IMO) and the International Civil Aviation Organization (ICAO). It took note of the information provided by ICAO and requested the secretariat to invite representatives of ICAO and IMO to report on their work to the SBSTA at its tenth session (FCCC/SBSTA/1998/9, para. 51 (i)).

14. The SBSTA encouraged the IPCC-OECD-IEA Programme on National Greenhouse Gas Inventories to make available to the SBSTA as soon as possible the results of the expert meetings on national feedback on the Revised 1996 IPCC Guidelines and on managing uncertainty in national GHG inventories (FCCC/SBSTA/1998/9, para. 51 (j)).

15. The SBSTA requested the secretariat to consult with the IPCC through the Joint Working Group on a comprehensive joint plan for the inventory programme covering scientific and operational aspects and including a clear division of responsibilities between the IPCC and the UNFCCC (FCCC/SBSTA/1998/9, para. 51 (k)).

Report of the COP on its fourth session (FCCC/CP/1998/16/Add.1)

16. Decision 11/CP.4:

"*The Conference of the Parties*:

...

2. *Requests* Annex I Parties to submit to the secretariat, in accordance with Article 12.1 and 12.2 of the Convention:

(a) A third national communication[1] by 30 November 2001 and subsequent national communications on a regular basis, at intervals of three to five years, to be decided at a future session. The Parties referred to in paragraph 1 [of the decision] should submit their second and subsequent national communications by the same dates;

(b) National inventory data on emissions of greenhouse gases by sources and removals by sinks on an annual basis by 15 April for the period up to the last but one year prior to the year of submission;

(c) Summary tables of national inventory data in electronic format and in hard copy. Additional and explanatory information should also, to the extent possible, be submitted in electronic format, as well as a hard copy."

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[1] This term includes communications from the regional economic integration organization included in Annex I to the Convention.

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Item 4 (a) of the provisional agenda

NATIONAL COMMUNICATIONS FROM PARTIES INCLUDED IN ANNEX I TO THE CONVENTION

GUIDELINES FOR THE PREPARATION OF NATIONAL COMMUNICATIONS

Report on the workshop on methodological issues related to greenhouse gas inventories

Note by the secretariat

Addendum

DRAFT REVISED TEXT OF THE UNFCCC GUIDELINES FOR REPORTING INVENTORY DATA BY ANNEX I PARTIES

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Mandate

1. The Subsidiary Body for Scientific and Technological Advice (SBSTA), at its seventh session, agreed to consider at its ninth session what, if any, additions and/or amendments to the revised guidelines for the preparation of national communications by Annex I Parties, would be required, taking into account the results of the on-going methodological activities related to greenhouse gas (GHG) inventories, together with inputs from other bodies, such as the Intergovernmental Panel on Climate Change (IPCC) (FCCC/SBSTA/1997/14, para.16 (d)).

2. The SBSTA, at its eighth session, requested the secretariat to organize a workshop with the participation of methodological experts from the roster, as well as from other relevant organizations, to develop proposals to resolve the methodological issues identified by Parties and by the secretariat while processing GHG inventories included in second national communications. The conclusions of such a workshop, and of any workshop organized by the secretariat related to possible additions and/or amendments to the revised guidelines for the preparation of national communications by Annex I Parties (decision 9/CP.2), should be available for the tenth session of the SBSTA (FCCC/SBSTA/1998/6, para. 40 (d)).

3. The SBSTA, at its ninth session, requested the secretariat to include the following topics on the agenda of the workshop with participation of methodological experts from the roster, namely: methods, reporting and implications for the review process and procedures (FCCC/SBSTA/1998/9, para. 51 (d)). Furthermore, the SBSTA requested the secretariat to prepare a report addressing clarifications, additions and amendments to the UNFCCC guidelines, particularly the GHG inventory section, taking into consideration information from the workshops organized by the secretariat, for its tenth session (FCCC/SBSTA/1998/9, para. 51 (e)).

Background and scope of the note

4. As requested, the secretariat organized a workshop on methodological issues related to GHG inventories, which was held in Bonn, from 9 to 11 December 1998. The report on this workshop is contained in document FCCC/SBSTA/1999/INF.1.

5. A draft of the inventory section of the revised guidelines for the preparation of national communications by Annex I Parties (decision 9/CP.2), referred to below as the UNFCCC guidelines, incorporating clarifications, additions and amendments, has been prepared based on the conclusions of the workshop and submissions from Parties (FCCC/SBSTA/1998/MISC.6, and Add.1-2).[1] It differs substantially from the text of the inventory section of the current UNFCCC guidelines, which can be found written in *italics* in document FCCC/SBSTA/1999/INF.1, annex I, paragraphs 2 to 16. The draft revised text is contained in the annex to the present document.

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[1] An initial submission from Austria on behalf of the European Community with views on options presented in document FCCC/SBSTA/1998/8 was also considered. It is included in document FCCC/SBSTA/1999/MISC.5.

6. The secretariat hopes that this note will facilitate the consideration of the issues relevant to possible additions and/or amendments to the inventory section by the SBSTA and by the representatives of Parties who will attend an SBSTA workshop, to be held in Bonn, from 17 to 19 March 1999. It could serve as starting point for considering the definitive content of guidelines for reporting inventory data. The draft of the inventory section of the UNFCCC guidelines will be revised after the workshop and made available to Parties for consideration by the SBSTA, at its tenth session.

7. Based on submissions by Parties and on suggestions made at the workshop, the guidelines for preparation of national communications from Annex I Parties have been separated into two parts. Part I will address GHG inventories and part II will address all other aspects of national communications. Part I includes guidance for annual inventories and inventory data reported in the same year as a national communication is submitted, which may be more expansive. The present document focuses on part I.

8. It should be noted that the methodological aspects of decisions of the Conference of the Parties (COP) and SBSTA conclusions adopted since decision 9/CP.2, included in annex II to the report of the workshop, were integrated *mutatis mutandis* into the revised draft text of the inventory section of the UNFCCC guidelines.

Possible action by the SBSTA

9. The SBSTA may wish to consider the information provided in this note, and any subsequent revisions based on the conclusions of the workshop referred to in paragraph 6 above, as well as on submissions from Parties, with a view to adopting the revised guidelines at its tenth session and forwarding them to the Subsidiary Body for Implementation (SBI) for consideration. If further clarifications, additions and amendments are warranted, the SBSTA may wish to provide guidance to the secretariat related to preparations for its eleventh session.

Annex

DRAFT OF THE GUIDELINES FOR PREPARATION OF NATIONAL COMMUNICATIONS BY PARTIES INCLUDED IN ANNEX I TO THE CONVENTION

PART I: INVENTORIES OF GREENHOUSE GAS EMISSIONS BY SOURCES AND REMOVALS BY SINKS

A. Objectives

1. The objectives of these guidelines for the preparation and reporting of national inventories of greenhouse gas emissions by sources and removals by sinks for the purposes of the United Nations Framework Convention on Climate Change (UNFCCC) by Parties included in Annex I to the Convention (Annex I Parties), referred to below as inventory guidelines, are:

(a) To assist Annex I Parties in meeting their commitments under Articles 4 and 12 of the Convention [and in preparing to meet their commitments under Articles 3, 5 and 7 of the Kyoto Protocol[1]];

(b) To facilitate the process of considering the inventory data contained in annual submissions and in national communications, including the preparation of technical analysis and synthesis documentation; and

(c) To facilitate the process of verification and technical/expert review of the inventory data.

B. Principles

2. National greenhouse gas emission inventories should be transparent, consistent, comparable, accurate and complete.

3. National greenhouse gas emission inventories should be prepared using comparable methodologies agreed upon by the Conference of the Parties (COP), as indicated in paragraph 8 below, and any "good practice" standards[2] that may be agreed upon by the COP at a future session.

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[1] Text in brackets throughout this annex indicates options, which may be included in these inventory guidelines.

[2] The IPCC currently has under development "good practice" standards as part of its work related to uncertainties in GHG inventories. These standards may be available for consideration by the SBSTA in 2000. Good practice standards may include among other information a series of quality assessment and quality control procedures to be applied during the preparation of national inventories.

4. In the context of these inventory guidelines:

Transparency means that the assumptions and methodologies used for estimation of greenhouse gas emission inventories should be easily understood and/or replicable by interested third Parties using the reported information. The transparency of national greenhouse gas emission inventories is fundamental to the success of the process for the communication and consideration of information, [including the information needed for assessing compliance with Parties' inventory-related commitments under the Kyoto Protocol].

Consistency means that a national inventory should be consistent in all its elements with inventories of other years. An inventory is consistent if the same methodologies are used for the base and subsequent and/or target years.

Comparability means that emission estimates reported by Parties in national inventories should be comparable among them. For this purpose, Parties should use the methodologies agreed by the COP for estimating and reporting national greenhouse gas emission inventories. Allocation of different source categories should follow the split of the Revised 1996 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories, at the level of summary and sectoral tables.

Completeness means that national inventories cover all sources of emissions included in the agreed methodology [, as well as other existing relevant source categories which are specific to individual Parties, and therefore may not be included in the agreed methodology.]

Accuracy is a relative measure of the exactness of a greenhouse gas emission estimate. However, given the nature of greenhouse gas emission estimates, it may be very difficult to quantify the accuracy of estimates. Therefore, to promote the accuracy of national inventories to the extent possible, appropriate methodologies [conforming to "good practice" standards] should be used.

C. Scope

5. These inventory guidelines cover the estimating and reporting of greenhouse gas emissions and removals of both annual national inventories and national inventories included in national communications, requested by decision 11/CP.4 (FCCC/CP/1998/16/Add.1). National inventory data on emissions of greenhouse gases by sources and removals by sinks should be submitted on an annual basis by 15 April for the last but one year prior to the year of submission (e.g. data for the year 1998 are to be submitted by 15 April 2000). National communications should be submitted according to the decisions of the Conference of the Parties. Third national communications should be submitted to the secretariat by 30 November 2001, in accordance with decision 11/CP.4.

D. Base year

6. According to the provisions of Article 4.2(b) of the Convention [and taking into account the provisions of Article 3.7 of the Kyoto Protocol], the year 1990 should be the base year for the estimation and reporting of national inventories of greenhouse gas emissions and removals. According to the provisions of Article 4.6 of the Convention and decisions 9/CP.2 and 11/CP.4, the following Annex I Parties that are undergoing the process of transition to a market economy, are allowed to use a base year or a period of years other than 1990, as follows:

Bulgaria:	to use 1988
Hungary:	to use the average of the years 1985 to 1987
Poland:	to use 1988
Romania:	to use 1989
Slovenia:	to use 1986

7. In line with Article 3.8 of the Kyoto Protocol, any Annex I Party may use 1995 as its base year for hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF_6), clearly indicating which base year was chosen.

E. Methods

Methodology

8. Parties should use the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories referred to herein as the IPCC Guidelines, to estimate and report on anthropogenic emissions by sources and removals by sinks of greenhouse gases not controlled by the Montreal Protocol. In accordance with the IPCC Guidelines, Parties should be able to use different methods (tiers) included in those guidelines, giving priority to those methods which are believed to produce the most accurate estimates, depending on the data availability. Parties that already have established and comparable methodologies which are believed to better reflect their national situation, could continue to use them, provided that they are compatible with the IPCC Guidelines and well documented.

9. The IPCC Guidelines offer a default methodology which includes default emission factors and in some cases default activity data. As these default data, factors and assumptions may not always be appropriate for specific national contexts, it is preferable that Parties use their own national emission factors and activity data, where available, given that the reporting of the emission estimates and their underlying data is transparent.

"Good practice" standards

10. [When preparing national greenhouse gas emission inventories, Parties should apply "good practice" standards[3] agreed upon by the SBSTA, in order to ensure that a minimum level of quality is met by all Parties].

Recalculations

11. Recalculations of the base year inventory as presented in previously submitted inventory data are allowed [only for emissions other than CO_2 emissions from *fuel combustion*], if they are necessary for the improvement of the accuracy of the inventory, are methodologically consistent, and are reported in a transparent manner. [Recalculations due to changes in the activity data are not allowed later than five years after the official submission of a given inventory]. The inventories of an entire time series, including the base year and subsequent and/or target years, should be estimated using the same calculation procedures, and the underlying activity data and emission factors should be gathered in a consistent manner.

Uncertainties

12. Parties should estimate the uncertainties[4] of their greenhouse gas emission inventories using the best methodologies available to them.

F. Reporting

1. General guidance

Emission estimates

13. Article 12.1(a) of the Convention requires that each Party shall communicate to the COP, through the secretariat, *inter alia*, a national inventory of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol. At a minimum, national inventories should contain information on the following six greenhouse gases: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), and sulphur hexafluoride (SF_6). Parties should also provide information on the indirect greenhouse gases carbon monoxide (CO), nitrogen oxides (NO_x) and non-methane volatile organic compounds (NMVOCs), and are encouraged to provide data on sulphur oxides.

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[3] See footnote 2.

[4] These inventory guidelines do not provide final guidance on reporting uncertainties, due to the fact that "good practice" standards for estimating and reporting on uncertainties are currently under consideration by the IPCC and relevant conclusions of the SBSTA have not been adopted yet.

14. Quantitative data related to inventories of greenhouse gas emissions and removals should be presented on a gas-by-gas basis in units of mass (Gg) with emissions by sources listed separately from removals by sinks, except in cases where it may be technically impossible to separate information on sources and sinks in the area of land-use change and forestry.

15. In addition, and in accordance with decision 2/CP.3, Parties should report aggregate emissions of the greenhouse gases, expressed in carbon dioxide-equivalent terms at summary [and sectoral] national inventory level, using global warming potential (GWP) values provided by the IPCC in its Second Assessment Report ("1995 IPCC GWP values") based on the effects of the greenhouse gases over a 100-year time horizon. A list of these values is given in annex I to these inventory guidelines.

16. Parties should report actual emissions of HFCs, PFCs and SF_6, where data are available, providing disaggregated data by substance in mass units (Gg), and in CO_2 equivalent using 1995 IPCC GWP values, as included in annex I to these inventory guidelines. Parties should make every effort to develop the necessary sources of data for reporting these emissions. In addition to reporting actual emissions, Parties should also report potential emissions as a subset, for reasons of transparency and comparability.

17. Parties should report emissions of any greenhouse gas whose GWP values have been identified by the IPCC and adopted by the COP, from the year they were identified, as well as for preceding years, according to paragraphs 15 and 16 above. Parties are further encouraged to report emissions of greenhouse gases for which GWP values are available in mass and carbon equivalent units. These emissions should be reported separately from national totals until such time as the GWP of such greenhouse gases are adopted by the COP.

18. Parties should report emissions by sources and removals by sinks from the *land-use change and forestry* sector using the current reporting format of the IPCC Guidelines.[5]

19. In accordance with the IPCC Guidelines, international aviation and marine bunker fuel emissions based upon fuel sold to ships or aircraft engaged in international transport should not be included in national totals, but reported separately. Parties should also report emissions from international aviation and marine bunker fuels as two separate entries in their national inventories.

Recalculations

20. Recalculations of greenhouse gas emission estimates as a result of changes in methods, emission factors and activity data or the inclusion of new sources which have existed since the

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[5] These inventory guidelines do not provide final guidance on estimating and reporting emissions by sources and removals by sinks from the *land-use change and forestry* sector, as methodological work on this subject is still in progress. Until the completion of that work by the IPCC and the adoption of the corresponding conclusions by the SBSTA, Parties are requested to use the current reporting format of the IPCC to provide information on this sector.

base year but were not reported before, should be provided for the base year and subsequent years up to the year in which the recalculations are made. Recalculations of the base year should be justified as an improvement of the accuracy of the inventory. In this regard, Parties should report these justifications. The information on the changes in calculation methods, changes in emission factors and activity data used, and inclusion of new sources, should be fully transparent, explicitly indicating the relevant changes in each source category where these changes have taken place.

Completeness

21. Where methodological or data gaps in national inventories exist, information on these gaps should be presented in a transparent manner. Parties should clearly indicate the sources and sinks not considered in their inventories but considered in the IPCC Guidelines, and explain the reason for the exclusion, in order to avoid arbitrary interpretation of the exclusion of specific sources or sinks by a given Party. In addition, Parties should use the standard indicators presented below to fill the blanks in all the tables of the national inventory. This approach facilitates assessment of the completeness of a national inventory. The standard indicators are as follows:

(a) "NO" (not occurring) for emission sources that do not occur in a given country;

(b) "NE" (not estimated) for existing emission sources which have not been estimated;

(c) "NA" (not applicable) for emissions of a given greenhouse gas that is not applicable in a given source category;

(d) "IE" (included elsewhere) for sources estimated but included elsewhere in the inventory instead of the supposed source category;

(e) "0 " for sources of emissions that are insignificant or close to zero.

22. If Parties estimate emissions from country-specific sources which are not part of the IPCC Guidelines, they should explicitly describe what source categories these are, as well as what methodologies, emission factors and activity data have been used for their estimation.

Verification

23. In accordance with the IPCC Guidelines, and for verification purposes, Parties should compare their national estimates of carbon dioxide emissions from *fuel combustion* with those estimates obtained using the IPCC reference approach, and report on them both in annual inventory submissions and inventories included in national communications. Parties are encouraged to compare their national estimates, other than carbon dioxide emissions from *fuel combustion*, with estimates obtained using IPCC default methodology for other significant

greenhouse gas emission source categories.[6] The results could be given as percentage differences with respect to the national emission estimate, in order to avoid the appearance of countries having dual emission estimates.

Uncertainties[7]

24. When reporting GHG emission inventory data the level of uncertainty associated with these data and underlying assumptions should be indicated. The methodologies used for estimating uncertainties should be reported in a transparent manner. [Parties are encouraged to report information on uncertainties[8] in both emission factors and underlying activity data]. [Parties are encouraged to provide, to the extent possible, quantitative information on uncertainties on a gas-by-gas basis for individual source categories and on the overall uncertainty of aggregate GHG emissions in CO_2 equivalent, for both annual and trend estimates of the reporting period].

Adjustments

25. National inventories of greenhouse gas emissions are to be reported without adjustments related to climate variations or trade patterns of electricity. If Parties carry out such adjustments to inventory data, they should be reported separately and in a transparent manner, with clear indications of the method followed. Adjustments are regarded as important information in relation to the monitoring of emission trends and the performance of national policies and measures. Individual Parties may choose whether adjustments are applied, in addition to reporting unadjusted inventory data, and if so, which methods are chosen. Parties are further encouraged to share with others their experience with the application of adjustments.

2. Common reporting format

26. Parties should report their national greenhouse gas emission estimates to the Convention, through the secretariat, using a common reporting format. It should be provided both electronically and in hard copy on an annual basis.

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[6] The IPCC-OECD-IEA Programme on National Greenhouse Gas Inventories recently completed software for estimating GHG emissions following methods defined in the IPCC Guidelines, including the IPCC reference approach. The software may facilitate the provision of comparative information by Parties. It currently can be found at the Web site of the above-mentioned programme (http://www.iea.org/ipcc.htm).

[7] More rigorous requirements for reporting uncertainties may be requested by the SBSTA once the ongoing work of the IPCC on this matter is completed.

[8] The information requested in the two options in brackets may be useful for comparative purposes and as input to the IPCC activity.

27. The common reporting format is provided in annex II to these inventory guidelines. It consists of:

(a) Summary and sectoral[9] tables provided in the IPCC Guidelines;

(b) Sectoral background data tables for reporting of aggregate emission factors and activity data;

(c) IPCC reference approach for carbon dioxide emissions from *fuel combustion* providing the IPCC worksheet 1-1, a table for presenting the comparison with national estimates and explanations of any significant change resulting from the comparison; and

(d) Tables[10] for reporting aggregate CO_2 equivalent emissions, recalculations, completeness of the GHG emission inventory, uncertainty, feedstocks and bunkers, and a check-list of the main inventory information requested by these inventory guidelines.

28. The common reporting format follows the source category split of the IPCC sectoral tables. It provides a minimum set of information on methods, aggregate emission factors, and activity data, as well as relevant assumptions that underlie the emission estimates given in the sectoral tables.

29. The information provided by the common reporting format is aimed at enhancing transparency of the inventories by facilitating, *inter alia*, activity data verification, aggregate emission factors cross-comparisons among Parties, and easy identification of possible mistakes, misunderstandings and omissions in the inventories.

30. The common reporting format is a standardized format for electronically reporting GHG emission estimates. It will be provided to Parties by the secretariat and will also be available on the UNFCCC Web site. Parties should use this format to submit inventory information. The common reporting format allows for improved handling of electronic submissions, and facilitates processing of inventory data and preparation of useful technical analysis and synthesis documentation.

3. Annual inventory submissions

31. Greenhouse gas emission inventories submitted to the secretariat on an annual basis should contain inventory data for the last but one year prior to the year of submission. For

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[9] A new sectoral table for reporting HFC, PFC and SF_6 emissions separately was developed and included in the common reporting format.

[10] The final set of tables to be included in these guidelines will be defined according to the final common reporting format to be adopted by the SBSTA.

presentation of the greenhouse gas emission estimates, Parties should use the common reporting format described in paragraph 27 above.

32. Information should be updated when Parties change their methods, data sources, and assumptions or include new sources which have existed since the base year, but were not reported. Annual submissions in years when substantial changes have occurred should update all detailed information provided in prior submissions. If different calculation procedures are used in any year subsequent to the base year, Parties should submit updated time series data for the base year and the years in between, providing all the information requested in the common reporting format for the base year and relevant tables of this format for the years in between. When methods, data sources and assumptions do not change between submissions, they do not have to be reported. Reporting unchanged data should be avoided.

4. Inventory submissions during years when national communications are prepared

National communications

33. The national greenhouse gas emission inventory should be presented in the national communication using summary, sectoral and CO_2 equivalent tables for the entire period covered, for purposes of illustrating trends in gas-by-gas and aggregate emission data and by sectors.

Official supplement on GHG inventories to national communications

34. In the years when national communications are submitted, GHG inventories should contain more detailed and complete information than in the annual inventory. If needed, the SBSTA or the SBI may also request Parties to submit more detailed and complete information for any year in which a national communication was not submitted.

35. The detailed information to be submitted in such years could be provided with the national communication or as an official supplement to the national communication. The official supplement may be provided together with the annual submission of inventory data but not later than the submission of the national communication (see decision 11/CP.4).

36. The official supplement should contain sufficient information to ensure the transparency of the reported inventory. It should contain the necessary information for further consideration of annual inventory submissions in a transparent manner for all years of the period[11] which begins with a given national communication.

37. In addition to the information requested in paragraphs 31 and 32 above, the inventory for such a year should include:

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[11] This period is completed in the year the new national communication is due.

(a) IPCC summary [and sectoral] tables for all years from the base year to the last but two year prior to the year of submission, as well as CO_2 equivalent estimates of the greenhouse gas emissions for the entire time series reported;

(b) A description of the specific methodologies used for each sector. It should include an indication of the level of complexity (IPCC tiers) applied and a description of any national methodology used by the Party;

(c) Recalculations related to previously submitted inventory data as requested in paragraph 29 above;

(d) The references or sources of information related to emission factors and activity data and a rationale for their selection;

(e) Information on assumptions and presentation conventions underlying the emission estimates, such as whether emission estimates from the *energy* sector are based on net or gross calorific values;

(f) Information on uncertainties as requested in paragraph 24 above;

(g) Information on the national inventory system, data collection and internal verification procedures used to check the reliability and accuracy of the inventory data, and;

(h) Specific information on feedstocks and bunkers:

(i) With regard to possible double counting or non-counting of emissions, Parties should indicate whether feedstocks have been considered in the inventory, and if so, how they have been considered, clearly indicating the allocation in the respective source categories;

(ii) Regarding the reporting of emissions from bunker fuels, Parties should explain how they distinguish between domestic marine and aviation emissions, which are to be included in national totals, and international bunker emissions.

G. Uses of inventory data

38. Annual inventory data are compiled annually by the secretariat and provided to the subsidiary bodies each year. Inventory data included in national communications are compiled by the secretariat in the context of the compilation and synthesis of all national communications by Annex I Parties. These compilations are intended to facilitate the consideration of GHG inventory data by the SBSTA and the SBI.

39. The methodological problems which affect the reporting of transparent, comparable and consistent inventory data to the Convention are assessed by the secretariat with the support of experts nominated to the roster by governments. These assessments, aimed at identifying and solving such problems, are carried out by the secretariat in the context of the work programme on methodological issues, taking into account information from the IPCC and following the relevant decisions of the COP and conclusions of the SBSTA.

40. Issues related to inventory data included in national communications are clarified in the context of the in-depth reviews of national communications according to decision 2/CP.1.

41. Parties are encouraged to provide timely clarifications and additional information related to previously submitted national inventories to in-depth review teams and to the secretariat in order to facilitate the analysis and compilation of the information and the assessment of methodological issues related to GHG inventory data.

H. Record keeping

42. Parties should gather and archive all relevant inventory information for each year, including all disaggregated emission factors, activity data and documentation about how these factors and data have been generated and aggregated for the reporting of the national inventory. This information should allow the reconstruction of the GHG inventory by the expert review teams. Inventory data should be archived from the base year, including the corresponding data of recalculations to be applied. The paper trail should enable an emission estimate to be traced back to the original disaggregated emission factors and activity data. This information should also facilitate the timely process of clarifying inventory data when the secretariat prepares annual compilations of national inventories or assesses methodological issues. Parties are encouraged to collect and gather the information in a single national inventory facility or to, at least, keep the number of facilities to a minimum. Parties are also encouraged to electronically post complete inventory information on national Web sites.

I. Systematic updating of the guidelines

43. Relevant future decisions by the COP and conclusions by the subsidiary bodies regarding the preparation or reporting of GHG inventories under the Convention should be applied *mutatis mutandis* to these inventory guidelines, which should be updated accordingly.

Annex I to these inventory guidelines

1995 IPCC GWP VALUES WITH 100-YEAR TIME HORIZON

Annex II to these inventory guidelines

COMMON REPORTING FORMAT

(A first draft of Annex II to these inventory guidelines will be available at the beginning of March 1999, and could be sent electronically, on request. A final draft, considering the conclusions of the workshop referred to in paragraph 6 of this note will be available for the tenth sessions of the subsidiary bodies (FCCC/SB/1999/1 and Add.1.)

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NATIONAL COMMUNICATIONS FROM PARTIES INCLUDED IN ANNEX I TO THE CONVENTION

GUIDELINES FOR THE PREPARATION OF NATIONAL COMMUNICATIONS

Comparison of greenhouse gas inventories submitted by Parties using own national methodologies with those obtained using the IPCC default methodologies

Note by the secretariat

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I. INTRODUCTION

A. Mandate

1. The Subsidiary Body for Scientific and Technological Advice (SBSTA), at its seventh session, invited Annex I Parties to make available to the secretariat by 6 June 1998, for purposes of comparison and transparency, their complete 1996 greenhouse gas (GHG) inventories obtained using, when possible, best available methodologies and those obtained using the current Intergovernmental Panel on Climate Change (IPCC) default methodologies. The SBSTA requested the secretariat to draw upon the roster of experts to analyse and compare the results and assess the adequacy of information and the implications for meeting emissions limitation or reduction objectives (FCCC/SBSTA/1998/14, para. 16 (b)). At its eighth session, the SBSTA extended the deadline of the above-mentioned submissions to 15 August 1998 (FCCC/SBSTA/1998/6, para. 40 (c)).

2. The SBSTA, also at its eighth session, requested the secretariat to organize a workshop with the participation of methodological experts from the roster, as well as from other relevant organizations, to develop proposals to resolve the methodological issues identified by Parties and by the secretariat while processing GHG inventories included in second national communications. The conclusions of such a workshop, and of any workshop organized by the secretariat related to possible additions and/or amendments to the revised guidelines for the preparation of national communications by Annex I Parties (decision 9/CP.2) were to be made available for the tenth session of the SBSTA (FCCC/SBSTA/1998/6, para. 40 (d)).

B. Background

3. In response to the above mandate, the secretariat prepared an informal paper: "Comparison of GHG inventories submitted by Parties using own national methodologies with those obtained using the IPCC default methodologies" based on the submissions received from Parties.

4. The informal paper was presented to experts at a workshop organized by the secretariat on methodological issues related to GHG inventories, that was held in Bonn, from 9 to 11 December 1998. The present note, prepared by the secretariat, is a revised version of the informal paper and considers comments provided by experts from the roster.

C. Scope of the note

5. This note provides a comparison of GHG emission estimates obtained using national methodologies and the current IPCC default methodologies based on submissions[1] from five

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[1] The submissions from Norway and the United Kingdom were distributed at the workshop as they contained detailed supplementary explanations. New Zealand provided detailed explanations on the differences in estimates arising from the use of the two different methodologies, which were also distributed.

Parties (Austria, New Zealand, Norway, Switzerland and the United Kingdom of Great Britain and Northern Ireland) and one international programme (IPCC-OECD-IEA Programme for National Greenhouse Gas Inventories). The paper analyses the differences in annual inventories, as well as differences in the trend over the period 1990 to 1996, resulting from the use of different methodologies.

D. Possible action by the SBSTA

6. The SBSTA may wish to consider the information provided in this note and to determine whether additional analyses are warranted. If so, the SBSTA may wish to request Parties that have not yet provided the data mentioned above, to provide such data before its eleventh session. It may also wish to consider broadening the scope of the current request to Parties to include inventory data for the period 1990-1996, instead of for a single year. This would enable a further assessment of the impacts of different methods on trends. The SBSTA may also wish to provide guidance to the secretariat on any future analyses including the questions it wishes the secretariat to address. Such analysis could be reflected in the work programme of the secretariat in the next biennium in the context of the work on methodological issues related to Articles 5, 7 and 8 of the Kyoto Protocol (FCCC/SB/1999/2).

II. DIFFERENCES IN THE SCOPE OF SUBMISSIONS FROM PARTIES

A. Coverage

7. In response to the request noted in paragraph 1, the submissions of Parties varied, regarding the gases and sectors reported on, degree of completeness, approach (reference or sectoral) used for comparing results in the energy sector, and level of explanation given for the differences arising from the comparison.

8. The IPCC Guidelines for National Greenhouse Gas Inventories were developed for a wide range of users, and they allow Parties great flexibility in estimating their GHG inventories.[2] Parties may use default or more advanced methodologies, either from the IPCC Guidelines, which provide methodologies with different levels of complexity (tiers), or national or other compatible methodologies. The choice of emission factors is also flexible. This means that even the application of IPCC default methodologies may imply some differences in their use.

9. Two Parties, Norway and the United Kingdom, provided their complete 1996 carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) emissions inventories estimated by using both the IPCC default and national methodologies. These Parties went beyond the SBSTA request by estimating their complete inventories for the years 1990 to1996 inclusive. This provides a preliminary opportunity to assess the implications of using different methodologies,

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[2] Detailed information on the multiple approaches which Parties can use to estimate their emissions in each different sector of their GHG inventories, is provided in document FCCC/SBSTA/1998/7, paragraph 13.

not only for annual emission estimates, but also for analyses of trends. The United Kingdom[3] also provided estimates of hydrofluorocarbon (HFC), perfluorocarbon (PFC) and sulphur hexafluoride (SF_6) emissions based on the IPCC default and a national methodology. The secretariat did not include the comparison of these gases in the main tables of this paper because this information was provided by only one Party. However, the information is presented in the annex to this paper.

10. New Zealand[3] submitted data on CO_2, CH_4 and N_2O emissions from the *energy* sector, and CH_4 emissions from the *agriculture* sector, that were obtained by using the IPCC default and national methodologies. Two Parties, Austria and Switzerland, calculated their CO_2 emissions from the *energy* sector using the IPCC reference approach. The secretariat compared these estimates with those estimates provided in the annual 1996 inventory, which were estimated using national methodologies. The IPCC-OECD-IEA Programme for National Greenhouse Gas Inventories conducted a comparison between the IPCC default methodology and national methodologies used by Australia and the United States of America for estimating CH_4 emissions from livestock for 1990.

11. When comparing national methodologies to the IPCC default methodologies, the most important elements that differ are emission factors, calculation methods, and allocation of certain emission sources to sectors. This paper does not try to isolate the effect of each of these elements. Nevertheless, for purposes of consistency, the secretariat, as well as some Parties which submitted comparisons, has made adjustments to the estimates in order to consider emissions from source categories in the same sector. Therefore, the comparison of methodologies for total GHG emissions shows, where possible, the overall effect on emission estimates of using different calculation methods and emission factors. Nevertheless, the effect of including additional source categories in the two compared methodologies is also considered.

12. An overview of gases, sectors and years for which data comparison between IPCC default methodologies and national methodologies is available in submissions from Parties as provided in table 1.

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[3] Emission estimates from international bunkers and for the precursor gases and sulphur dioxide (SO_2) obtained by using default methodologies, were provided by New Zealand and the United Kingdom, but have not been considered in this paper.

Table 1. Gases, sectors and years for which data comparison is available in submissions by Parties

Gas	Sector	Austria	New Zealand	Norway	Switzer-land	United Kingdom	IPCC-OECD-IEA	
							Australia	United States
CO_2	Energy reference approach	X	X	X	X	X		
	Energy sectoral approach		X	X		X		
	Non-energy			X		X		
CH_4	Energy		X	X		X		
	Agriculture		X	X		X	X	X
	Waste			X		X		
N_2O	Energy		X	X		X		
	Agriculture			X		X		
Year/s		1996	1996	1990 - 1996	1996	1990 -1996	1990	1990

B. National methodologies used by Parties for estimating GHG emissions

13. An overview of the national methodologies[4] used by Parties is shown in table 2. Details on methodologies used by Parties are provided in the annex, which includes comparison tables between the national and the default methodology for each Party.

[4] The information on national methodologies used by Parties is taken from second national communications, supplementary material and submissions on comparisons provided by Parties.

Table 2. National methodologies used by Parties for estimating national GHG emissions

Sector	Austria	New Zealand	Norway	Switzerland	United Kingdom
Energy					
Methodology	CORINAIR	Tier 1 (sectoral)	CS, (similar to Tier 2)	CORINAIR	national/ CORINAIR
Emission factors	CS / CORINAIR defaults	CS / IPCC defaults	CS	CORINAIR defaults /CS	CS/defaults
Energy - Reference approach		EF: CS / IPCC defaults		EF: CORINAIR defaults	EF: CS / IPCC defaults
Fugitive fuel emissions		Tier 1	Tier 1 / Tier 3		CS
Methodology					
Emission factors		CS / IPCC defaults	CS		CS
Industrial processes					
Methodology			Tier 1		CS
Emission factors			CS		CS/defaults
Agriculture					
Methodology		CS	Tier1/ CS (similar to tier 2)		Tier 2
Emission factors		CS	CS/IPCC defaults		IPCC defaults/CS
Waste					
Methodology			CS		CS
Emission factors			CS		CS

Note:

CS stands for country-specific. EF stands for emission factors.
Tiers refer to the IPCC 1996 Revised Guidelines for National Greenhouse Gas Inventories.

C. Default methodologies used by Parties

14. Parties estimated their default inventories by following the methodology recommended in the IPCC Guidelines, but there were differences in approach. This is a consequence of the different levels of complexity identified in the IPCC Guidelines. An overview of the approaches used by Parties when estimating and reporting their GHG emissions according to the methodologies provided in the IPCC Guidelines is given in table 3.

Table 3. Approaches used by Parties for obtaining default estimates following the IPCC Guidelines

Sector	Austria	New Zealand	Norway	Switzerland	United Kingdom[a]
Energy					
Methodology	Reference approach	Sectoral[b] tier 1	Reference and Sectoral approach tier 1	Reference approach	Sectoral[b] tier 1
Presentation of results	Worksheet 1-1	Worksheets 1-2, 1-3	Worksheets 1-1, 1-2, 1-3	Worksheet 1-1	Sectoral table, worksheets 1-2, 1-3
Fugitive fuel emissions					
Methodology		Tier 1	Tier 1		Tier 1
Presentation of results		Worksheets 1-6, 1-7	Worksheet 1-7		Sectoral table, worksheets 1-6, 1-7
Industrial processes					
Methodology			Tier 1a / 1b		Tier 1
Presentation of results			Worksheet 2-1, 2-2, 2-3, 2-4, 2-6, 2-9, 2-11, 2-10, 2-7		Sectoral table, worksheets 2-1 to 2-4, 2-6 to 2-11
Agriculture					
Methodology		Tier 1	Tier 1		Tier 1
Presentation of results		Worksheet 4-1	Worksheet 4-1, 4-5, 4-5A, 4-5B		Sectoral table, worksheets 4-1, 4-5, 4-5A, 4-5B
Waste					
Methodology			Tier 1		Tier 1
Presentation of results			Worksheet 6-1, 6-1A, 6-1C, 6-2, 6-4		Sectoral table, worksheets 6-1, 6-1C, 6-2, 6-4

[a] The United Kingdom also provided estimates from the *land-use change and forestry* sector based on the IPCC default methodology. This sector has not been considered in this report as methodological work is still in progress in this sector. The Party further submitted IPCC worksheets for estimation of HFCs, PFCs and SF6. As these gases were not considered in the comparison, these worksheets have not been listed in this table.

[b] New Zealand and the United Kingdom also provided an estimate for CO_2 emissions from *energy* using the reference approach (worksheet 1-1) but applying mainly own emission factors. The comparison with the national inventory was limited to estimates obtained using the sectoral approach.

III. COMPARISON

A. Differences in annual estimates

15. The percentage differences between the IPCC and national emission estimates for each individual sector are listed in table 4. For each source category considered, those differences show a high degree of variation from Party to Party.

16. In the *energy sector (fuel combustion* and *fugitive fuel emissions)* CO_2 emissions estimated using IPCC default methodologies range from 4 per cent below to plus 5 per cent above national estimates. In Austria,[5] however, an important deviation of approximately 19 per cent is observed. This difference appears to be the consequence of a different allocation of emissions to different sectors in the two methodologies. In the national methodology, CO_2 emissions from the use of hard coal in the iron and steel industries are included in the *industrial processes* sector, while in the reference approach all hard coal is considered in the *energy* sector. Where a reference approach was used, estimates for CO_2 fuel combustion emissions were always higher than when using the sectoral approach.[6] In contrast, when using the sectoral approach applying the default methodology, estimates were lower than national ones for two out of three Parties.

17. For CH_4 and N_2O emissions, the percentage differences in estimates are generally much higher than for CO_2. However, these differences have large variations among sectors. For example, differences between CH_4 estimates obtained using different methodologies in *enteric fermentation* are generally lower than for *manure management*, whilst differences in N_2O estimates in *agricultural soils* are generally lower than for *fuel combustion*.

18. Analysis revealed that different allocations of source categories to sectors, or the inclusion in the national methodologies of additional source categories not part of the IPCC default methodologies, had the most significant impact on differences in estimates between the national and default methodologies, therefore causing higher differences than the use of different calculation methods or emission factors (see annex, table 3.A). Examples of the first case are emissions resulting from the production of iron and steel, and, of the second case, waste incineration, industrial waste or offshore oil and gas.

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[5] Austria provided an additional explanation, stating that as they used CORINAIR it is not possible to clearly differentiate between emissions resulting from combustion and from industrial processes in the industrial sector.

[6] Detailed explanations of these differences were provided in the submissions of Norway, "Emissions of greenhouse gases in Norway - estimated by the default IPCC methodologies and the Norwegian national inventory model", and the United Kingdom, "Comparison between the IPCC default and UK detailed inventories 1990-1996" on pages 13-15 and 9, respectively.

19. For the sake of consistency, the secretariat applied adjustments for source categories not included in one or the other methodology to the estimates provided by Norway and the United Kingdom, being the only Parties that provided full GHG inventories.[7] The application of adjustments ensures that the same sources have been accounted for with both methodologies and that the deviations between the methodologies are mainly a consequence of the use of different emission factors and calculation methods, and not of different source accounting.

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[7] Norway and the United Kingdom also considered adjustments in their respective submissions, where detailed explanations on this issue can be found. For the United Kingdom, the secretariat used the adjusted values provided by the Party. These adjustments exclude the source categories not considered in the IPCC but considered in the national methodology. In order to apply the same kind of adjustments to both Parties' estimates, values provided by Norway have basically been adjusted by excluding from the national estimates those source categories not included in the IPCC methodology.

Table 4. Differences between IPCC default and national estimates for 1996
(Difference relative to the estimates obtained using national methodologies, national estimates = 100 per cent)

Gas	Sector	Difference in annual estimates (per cent)						
		Austria	New Zealand	Norway	Switzer-land	United Kingdom	IPCC-OECD-IEA 1990	
							Austra-lia[a]	United States[a]
CO_2	Fuel combustion reference approach	18.8		5.0	2.2			
	Fuel combustion sectoral approach[b]		-0.2	0.7		-4.0		
	Industrial processes					12.0		
	Non-combustion (industrial processes and other)[b]			-0.8				
	Total (fuel combustion and other sectors)[b]			**0.4**		**- 1.3**		
CH_4	Fuel combustion		-42	-49		-18.8		
	Fugitive: oil and gas		-65	75.0		2.3		
	Coal mining		-43	7		-1.4		
	Enteric fermentation		-34.5	-4.3		1.6	-6.6	-3.8
	Manure management		92.7	-25.0		4.6	26.3	-43.1
	Total livestock		-23	-7.3		2.0	0.6	-16.2
	Waste[b]			-27.0		10.0		
	Total adjusted[b]			**-32.7**		**5.1**		
N_2O	Fuel combustion		-59	-89		-44.6		
	Agricultural soils			27.3		27.0		
	Total adjusted[b]			**-1.6**		**4.0**		
Aggregate GHG (CO_2 equivalent)[b]				**-5.2**		**-0.2**		

[a] Comparison carried out by the IPCC-OECD-IEA Programme for National Greenhouse Gas Inventories: "Comparison of methane emissions from agriculture using IPCC default methodology and two national methodologies", Pierre Boileau, OECD. The comparison is based on 1990 instead of 1996 figures. Results given in this table differ slightly from those given in the IPCC-OECD-IEA submission as the secretariat used another approach for estimating the differences between methodologies, setting the national estimates at 100 per cent.

[b] Adjustments made for sources not included in the default or the national methodology, as explained in paragraph 18 of this paper. For further details on the adjustments made for Norway, please refer to annex, table 3.A.

20. The allocation of source categories to different sectors when using different methodologies does not affect the total GHG emissions, either on a gas-by-gas basis or on an aggregated CO_2 equivalent basis. However, different allocations could lead to large differences in the estimates of GHG emissions for individual sectors or subsectors.

21. On the other hand, the inclusion or omission of particular source categories could lead to large differences in emission estimates by sector, as well as in totals on a gas-by-gas basis or aggregate CO_2 equivalent basis. For example, in some cases, the IPCC default methodologies do not include some source categories which were included in the national methodologies of Norway and the United Kingdom, causing differences in estimates. The magnitude of these differences can be observed in table 5, where the column "without adjustments" presents the differences in results with the inclusion of additional source categories in the national methodologies. These results indicate the importance of complete reporting of all existing source categories, because without the adjustments the differences appear to be larger.

Table 5. Differences in annual total national GHG emission estimates between national and default methodologies deriving from the inclusion of additional source categories (1996)

Gas		Difference in annual estimates (per cent)[a]			
		Norway		United Kingdom	
		Without adjustments	With adjustments[b]	Without adjustments	With adjustments[b]
CO_2	Total	-5.1	0.4	-2.7	-1.3
CH_4	Total	-45	-33	5.1	5.1
N_2O	Total	-80	-1.6	-1.2	4.0
Aggregate GHG (CO_2 equivalent)		-15	-5.2	-1.3	0.2

[a] Difference relative to the estimates obtained using national methodologies, which are set at 100 per cent in this table.

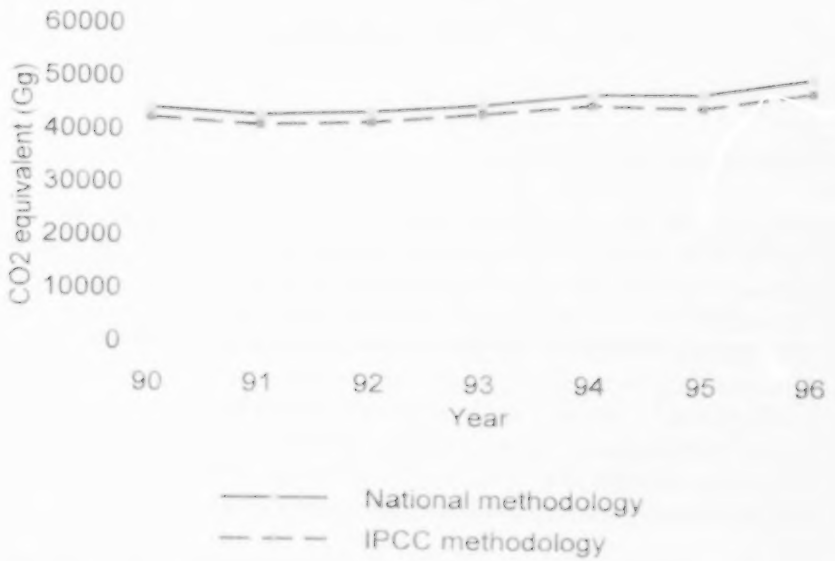
[b] Adjustments made for sources not included in the default or the national methodology, as explained in paragraph 18 of this paper. For further details on the adjustments made for Norway please refer to annex, table 3.A. In both cases, the "with adjustment" column reflects only the differences deriving from the use of different emission factors and calculation methods.

B. Differences in trends[8] over the period 1990 to 1996

22. For the two cases examined, Norway and the United Kingdom, it appears that differences in emission estimates for various sectors using two methodologies are much lower as related to a trend over several years, 1990 to 1996, than for an individual year, as can be seen in table 6.

23. Estimates of aggregate emissions, expressed in CO_2 equivalent, obtained with the IPCC default methodologies and with the more comprehensive methodologies of Norway and the United Kingdom range from approximately 6 per cent lower to 1 per cent higher for a single year. However, when looking at trends, differences between the results obtained with the two methodologies are much smaller, the trend in the default estimates being 0.5 to 1.2 percentage points lower than the trend obtained using the national methodologies. The differences in absolute units are illustrated in figures 1 and 2. From both figures, it is evident that the use of either methodology is no impediment to tracking the trend of aggregate GHG emissions over a given period of time.

Figure 1. Trend in aggregate GHG emissions[a] estimated with the IPCC and the national methodology in Norway



[a] This figure is based on adjusted values (for adjustments see annex, tables 3.A and 4.A).

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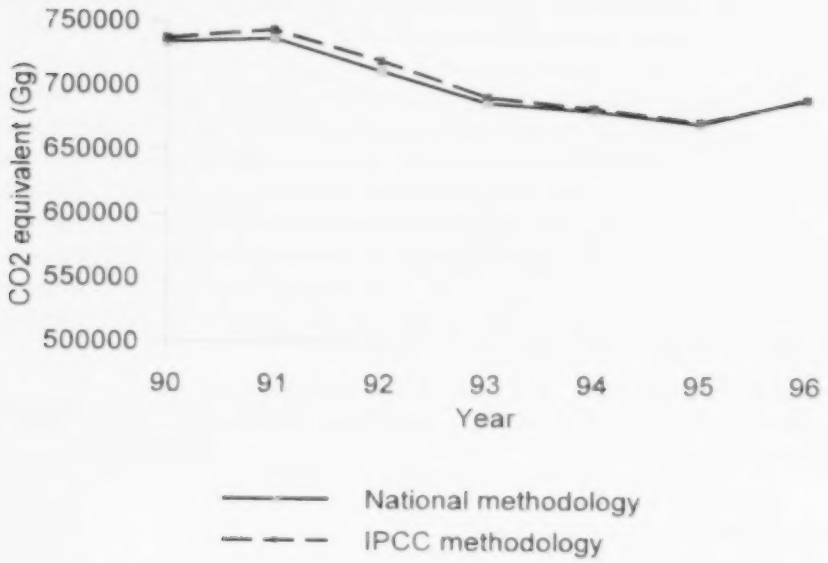
[8] The term "trend" in this report indicates the change of GHG emissions over the period 1990 to 1996. This approach is used because the estimation of inventory data over a given period of years, such as in commitment periods, will be an important element for consideration of compliance under the Kyoto Protocol.

Figure 2. Trend in aggregate GHG emissions[a] estimated with the IPCC and the national methodology in the United Kingdom



[a] Based on adjusted values provided by the Party.

24. Regarding CO_2 emissions, similarities in the trend can be found for all relevant emission sources considered. When using the IPCC default methodology, the percentage reductions or increases in relation to the 1990 base year are fairly close to trends obtained with the national methodology for both Parties considered here. This is true both for the individual source categories of *fuel combustion* and *industrial processes*, and for total CO_2 emissions. In the United Kingdom, total CO_2 emissions are shown to have decreased by 3.1 per cent using the national methodology and 3.7 per cent using the default methodology between 1990 and 1996, whereas for Norway the percentage changes were increases of 14.9 and 15.8 per cent, respectively. Therefore, for total CO_2 emissions, the difference in the trend was 0.9 and -0.6 percentage points for Norway and the United Kingdom, respectively.

25. The situation is different with respect to trends in CH_4 emissions, for which the agreement between the different methodologies is lower than for CO_2 (-9.9 and 1.9 percentage points difference for Norway and the United Kingdom, respectively). Furthermore, the situation is different for different source categories. For both Parties, significant discrepancies between default and national estimates have been found for individual source categories. There are similarities in the trends for *fuel combustion* (-1.3 and -4.8 percentage points), *coal mining* (0.0 and -0.4 percentage points) and *livestock* (0.6 and -0.7 percentage points), but significant discrepancies have been found for individual source categories, for example for *oil and natural*

gas and *waste*. In both sectors, no common pattern has been found; opposite trends emerged from the use of the default methodology for one of the Parties, while for the other Party the trend was similar to the national one[9] (see annex, tables 4.A and 7.A).

26. The differences in the emission trends for total N_2O emissions are in a similar range as for CH_4 (7.0 and 2.6 percentage points lower for Norway and the United Kingdom, respectively). Opposite trends in emissions estimated with the two methodologies have not been observed for any single source category. However, in some cases, the difference in the trends was significant, such as for *fuel combustion* in Norway, where the default methodology gave a trend 42 percentage points lower than the national one. On the other hand, in the case of Norway, the use of different methodologies would result in opposite trends for total N_2O emissions if source categories included in the national but not in the default methodologies were not accounted for.

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[9] In the case of Norway, CH_4 emissions from the waste sector showed an increase of 44 per cent when using the national methodology, but a decrease of 8 per cent using the IPCC default methodology. For oil and natural gas the trends were similar, showing an increase of 60 and 56 per cent with the national methodology and the IPCC default methodology, respectively. By contrast, for the United Kingdom, emissions from the waste sector decreased by 9 and 14 per cent when using the national methodology and the IPCC default methodology, respectively. For oil and natural gas the use of the national methodology resulted in a decrease of 8 per cent over the period 1990 to 1996, compared with an increase of 64 per cent using the IPCC default methodology.

Table 6. Range of differences in annual estimates obtained using national and default methodologies, and differences in the trend over the period 1990 to 1996 for Norway and the United Kingdom

Gas	Sector	Range of differences in annual estimates over the period 1990 to 1996 [a] (per cent)		Difference in the trend over the period 1990 to 1996 (percentage points) [b]	
		Norway	United Kingdom	Norway	United Kingdom
CO_2	Fuel combustion reference approach	4.2 to 18.1		0.9	
	Fuel combustion sectoral approach [c]	0.1 to 1.1		0.5	
	Non-combustion (industrial processes and other) [c]	-3.5 to -2.6		2.6	
	Total (fuel combustion and other sectors) [c]	-0.5 to 0.9	-0.6 to -1.3	0.9	-0.6
CH_4	Fuel combustion	-50 to -47	-12 to -7	-1.3	-4.8
	Fugitive: oil and gas	25 to 80	-43 to 2.3	-4.4	72
	Coal mining	0	-1.4 to 1.0		-0.4
	Enteric fermentation	-4.6 to -3.4		0.3	
	Manure management	-31 to -20		2.4	
	Total livestock	-8.3 to -6.7	2.0 to 4.4	0.6	-0.7
	Waste [c]	-27 to 13.7	10.1 to 16.7	-52	-5.2
	Total adjusted [c]	-34 to -26	2.8 to 5.1	-9.9	1.9
N_2O	Fuel combustion	-89 to -84		-41.9	
	Industrial processes		-13.7 to 5.7		-8.8
	Agricultural soils/ agriculture	22.5 to 27.8	25.5 to 33	3.3	1.9
	Total adjusted [c]	-1.6 to 5.3	4.3 to 14.8	-7.0	-2.6
Aggregate GHG (CO_2 equivalent) [c]		**-5.6 to -3.8**	**-0.1 to 1.1**	**-1.2**	**-0.5**

[a] Difference relative to the estimates obtained using national methodologies, which are set at 100 per cent in this table. A positive difference denotes that estimates obtained with the IPCC default methodology are higher than those obtained with the national one.

[b] Results given in this column present the difference between the trend (in per cent) obtained using national methodologies and the trend (in per cent) using IPCC default methodologies, expressed as percentage points.

[c] Adjustments made for sources not included in the default or the national methodology, as explained in paragraph 18 of this paper. For further details on the adjustments made for Norway please refer to annex, table 4.A.

For the cases of Norway and the United Kingdom, it has also been observed that the inclusion of additional source categories in national methodologies does not have a large impact on the trend of aggregate GHG emissions expressed as CO_2 equivalent. For example, in the case of Norway, the results in the trends obtained using the IPCC default methodology without inclusion of the additional source categories considered in the national methodology only differ by 0.3 percentage points[10] in relation to the national methodology (see annex, table 4.A). It is clear that the impact of a given source category on the aggregate GHG emissions of a Party will depend on the relative contribution of this source category to the Party's aggregate GHG emissions.

IV. CONCLUSIONS

A. Annual estimates

27. Differences in annual estimates between sectors arising from the use of different methodologies vary widely according to the sectors and the specific greenhouse gases. For CO_2 emissions from the *fuel combustion* sector these differences are generally lower than 5 per cent, while in the case of CH_4 and N_2O differences in estimates are mostly in the order of several tens of per cent.

28. Extremely high differences in annual estimates arising from the use of different methodologies have been detected for particular sectors or subsectors, such as CH_4 emissions from *oil and natural gas* or *manure management*, and N_2O emissions from the *fuel combustion* sector. For these sectors, emission factors and calculation methods are based on completely different assumptions in the two methodologies.[11] Depending on the relative contribution of a given source category to a Party's aggregate emissions, the impact on the annual national inventory can be more or less significant.

29. Results obtained from Norway and the United Kingdom reveal that differences in estimates for total annual CO_2 emissions are small, default estimates being approximately 0.4 per cent higher and 1 per cent lower than estimates obtained with the national methodology. Results obtained for total CH_4 emissions differ from Party to Party, showing differences of 5 to -33 per cent. In the case of total N_2O emissions, differences are lower than 5 per cent for both Parties. This small difference does not reflect agreement between methodologies for this gas, but is mainly an effect of positive values cancelling out negative values at the sectoral level when

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[10] The difference of 0.3 percentage points between the increases of aggregate GHG emissions expressed as CO_2 equivalent (11.7 per cent with the national methodology and 12 per cent with the IPCC default methodology) are equivalent to a difference of 2.5 per cent, setting the increase obtained with the national methodology at 100 per cent.

[11] Different assumptions in national methodologies refer to country-specific studies or to consideration of country-specific conditions, which results in different and more detailed disaggregation of certain source-categories. For example, in the agricultural sector, when estimating CH_4 emissions from manure management, some Parties take into account their national conditions where manure is voided on pasture and degrades aerobically, and therefore produces little or no CH_4 emissions.

aggregating to total N_2O emissions.

30. The different allocation or inclusion in the national methodologies of additional source categories which are not part of the IPCC default methodologies have the most significant impact on the differences between annual estimates obtained using the national and default methodologies. These appear to cause higher differences in annual emission estimates than the use of different methodologies or emission factors. This fact highlights the importance of full reporting of all relevant GHG emission source categories by Parties.

B. Trends

31. GHG emission estimates obtained using the IPCC default methodologies differ from estimates obtained using national methodologies to a lesser extent for a consecutive set of years (such as a commitment period) than for annual estimates. Even if the percentage deviation in annual estimates is very high, it may not affect the emission trend.

32. The results in estimates of aggregate GHG emissions expressed in terms of CO_2 equivalent obtained using IPCC default methodologies and the more comprehensive methodologies of Norway and the United Kingdom show differences of around 1 percentage point (-1.2 and -0.5 percentage points, respectively), for the years 1990 to 1996 as a whole period, described as the "trend".

33. Trends in CO_2 emissions obtained using IPCC defaults and the national methodologies of Norway and the United Kingdom are also fairly close, the differences in the trends being 0.9 percentage point for Norway and 0.6 percentage point for the United Kingdom. The situation is slightly different with respect to CH_4 and N_2O emissions, where the trends differ by 9.9 percentage points (Norway) and 1.9 percentage points (United Kingdom) for CH_4, and by 7 percentage points and 2.6 percentage points for N_2O. However, since the relative share of these greenhouse gases in the aggregate GHG emissions of these two Parties is less significant, the differences in the respective trends are not significant enough to affect the aggregate.

34. For most of the source categories, similarities in the results using the two methodologies have been found for the three main greenhouse gases CO_2, CH_4 and N_2O. In general, the trends in emission estimates obtained using national and IPCC default methodologies have the same direction (+ or -) in relation to the base year. For the *waste* sector and for fugitive CH_4 emissions from *oil and natural gas* opposite trends emerged from the use of the default methodology for one of the Parties. Values for trends of greenhouse gas emissions estimated using national and IPCC defaults methodologies differed substantially for the *waste* sector for both Parties and for N_2O *fuel combustion* and *industrial processes* emissions for one Party.

35. The above-mentioned conclusions could have important policy implications for the way in which GHG inventory data are considered. However, it must be borne in mind that they were based upon the comparison of only two Parties. More comparisons would be necessary in order to draw definitive conclusions and to properly assess the implications.

36. The implications presented below may be relevant for the purpose of analysing trends and for meeting emissions limitation or reduction commitments under the Kyoto Protocol. However, the implications should not necessarily be applied to emissions trading and to accounting for emission reductions through projects under Article 6 or 12 of the Protocol.

37. Taking into account the fact that Norway and the United Kingdom have very comprehensive national methodologies for estimating GHG emissions, and in general use high tier levels for most of the sectors, some possible implications derived from the conclusions of this paper are as follows:

(a) The current flexible approach of using different methodologies for the estimation of GHG emissions is not an impediment to meeting emissions limitation or reduction commitments under the Kyoto Protocol;

(b) IPCC default methodologies could be sufficient to ensure the appropriate estimation of trends for national aggregate GHG emissions expressed as CO_2 equivalent and for emissions of several IPCC source categories, assuming they are applied well;

(c) The improvement of the quality of activity data could have a higher priority than the attempt to use higher tiers for those source categories where the approximation to national comprehensive methodologies is good.

C. General

38. All those Annex I Parties which use national methodologies for estimating their GHG emission inventories should be further encouraged to carry out a comparison of GHG emission inventories obtained using best available methodologies with those obtained using the IPCC default methodologies for the years 1990 to 1996. This information would be useful to assess the implications of the use of different methodologies for meeting emissions limitation or reduction commitments.

39. Full reporting of all relevant source categories is important. In order to facilitate this task, it would be useful to develop default methodologies for common existing source categories in many Parties, such as *waste incineration* and offshore emissions, for which IPCC default methodologies are not available so far.

40. There is a clear need to improve the IPCC default methodologies or to develop best appropriate national methodologies for those source categories where the differences both in annual estimates and in trends with the more accurate national methodologies are significant, such as in the *waste* and the *oil and natural gas* sector.

Annex

COMPARATIVE TABLES FOR INDIVIDUAL PARTIES

Comparative tables of GHG emissions for each individual Party are presented in this annex. The tables contain information for each individual gas and are organized by sector. Estimates obtained both with the Party's national and with the IPCC default methodology are given in full mass units (Gg) for each individual sector, while differences are given in full mass units (Gg) and in per cent. Where possible, aggregated GHG emission estimates in terms of CO_2 equivalent are also given. Differences given in the tables are relative to the estimates obtained using national methodologies, which are set at 100 per cent. This means that positive differences in all cases denote that estimates obtained with the IPCC methodology are higher than estimates obtained with the national methodology.

Table 1.A. Comparison of GHG inventories obtained using national and IPCC default methodologies: Austria, 1996

Gas	Sector	Emissions estimate in Gg		Difference	
		National method (sectoral approach)	IPCC default (reference approach)	Gg	%
CO_2	Fuel combustion	50 800[a]	60 358	9 558	18.8

[a] Value reported in the national 1996 GHG inventory.

Remarks:

Austria followed a sectoral approach using the CORINAIR methodology with a mix of CORINAIR default and national emission factors for estimating its national GHG inventory. These emission estimates obtained for CO_2 from *fuel combustion* are compared to CO_2 emission estimates obtained using the default IPCC reference approach, although for some fuel types national conversion factors have been applied.

The reference approach gives estimates 19 per cent higher than the estimates using the national methodology. This is mainly due to the fact that in the Austrian national GHG inventory CO_2 emissions from the use of hard coal in the iron and steel industries are included in the *industrial processes* sector. As in the industrial sector there is no distinction between combustion and process emissions, all emissions resulting from this sector are allocated to the *industrial processes* sector. National inventory experts informed the secretariat that approximately 70 per cent of the *industrial processes* emissions are combustion emissions, but this adjustment has not been included in the estimate given in table 1.

Another difference between the two compared methodologies lies in the feedstocks, which have been considered in the reference approach but not in the national inventory, since they are not explicitly accounted for in the CORINAIR methodology. However, the national inventory considers non-biogenic CO_2 emissions from waste incineration.

Table 2.A. Comparison of GHG inventories obtained using national and IPCC default methodologies: New Zealand, 1996

Gas	Sector	Emissions estimate in Gg		Difference	
		National method	IPCC default	Gg	%
CO_2	Fuel combustion reference approach [1]	25 590			
	Fuel combustion sectoral approach	24 671	24 620	51	-0.2
	Fugitive fuel emissions [2]	672	672	0	0
CH_4	Fuel combustion	10.8	6.3	-4.5	-41.7
	Solid fuel	20.1	11.6	-8.5	-42.5
	Oil and natural gas	8.6	3.1	-5.6	-64.5
	Enteric fermentation	1 414	926	-488	-34.5
	Manure management	17.1	176.0	159	927
	Total livestock	1 431	1 102	-329	-23.0
N_2O	Fuel combustion	10.7	0.3	-0.4	-59.2

[1] This value is given for information purposes but was not taken included in the comparison.

[2] Fugitive emissions from geothermal activities have been reported as an additional source category but are not listed separately in this table since there is no difference in the estimates (2.5 Gg CH_4 and 862 Gg CO_2 with both methodologies). Emissions from this source are accounted for in both values given for CO_2 fugitive fuel emissions.

Remarks:

New Zealand, in its submission, used the IPCC tier 2 (sectoral approach) to estimate emissions from the energy sector, both for the national and for the default estimate. A mix of country specific and default emission factors derived from the 1995 IPCC Guidelines s as applied in the national methodology. For fugitive fuel emissions, a tier 1 approach was followed in both methodologies. Based on national values a reference approach for estimating CO_2 emissions from the energy sector was also provided.

For *agriculture (enteric fermentation and manure management)* New Zealand used a national methodology that was based on a country study, using national emission factors. National emission factors for *enteric fermentation* are higher than those from the IPCC for all animal types (cattle, sheep, goats and deer). Of significance are the very different emission factors for *manure management* from dairy and non-dairy cattle. For these types of animals IPCC default values are significantly higher, changing total CH_4 emissions from this subsector by an order of magnitude. The significantly lower national emission factors result from the assumption that most animal waste decomposes aerobically on pasture, which results in relatively low levels of CH_4 emissions from *manure management*. Emissions from deer are considered in the national inventory but not in the default one. Adjusting the default estimates by adding emissions from deer would result in a difference between the two methodologies of 20 per cent for total livestock.

Further details on differences in emission factors and methodologies used can be found in the explanatory comments provided in the New Zealand submission, which was distributed at the workshop.

Table 3.A. Comparison of GHG inventories obtained using national and IPCC default methodologies: Norway, 1996

Gas	Sector	Emissions estimate in Gg		Difference	
		National method	IPCC default	Gg	%
CO_2	Fuel combustion: reference approach	32 485	34 114	1 629	5.0
	Fuel combustion: sectoral approach		31 286	-1 199	-3.7
	Fuel combustion (sectoral approach) adjusted [a]	31 082	31 286	204	0.7
	Non-combustion (industrial processes and other [b])	8 063	7 208	-855	-10.6
	Non-combustion, adjusted [c]	6 964	6 906	-58	-0.8
	Total	**40 548**	**38 494**	**-2 054**	**-5.1**
	Total adjusted [d]	**38 046**	**38 192**	**146**	**0.4**
CH_4	Fuel combustion	21	11	-10	-49
	Oil and natural gas	24	42 [e]	18	75.0
	Coal mining	Same methodology used		0	0
	Enteric fermentation	93	89	-4	-4.3
	Manure management	16	12	-4	-25.0
	Total livestock	109	101	-8	-7.3
	Waste	237	107	-130	-54.7
	Waste, adjusted [f]	147	107	-40	-27.0
	Total	**485**	**266**	**-219**	**-45.2**
	Total adjusted [g]	**395**	**266**	**-129**	**-32.7**
N_2O	Fuel combustion	3.06	0.35	-2.71	-89
	Agricultural soils	9.45	12.03	2.58	27.3
	Total	**18.1**	**12.7**	**-5.4**	**-29.8**
	Total N_2O adjusted [h]	**12.9**	**12.7**	**-0.2**	**-1.6**
Aggregate GHG (CO_2 equivalent)		**56 344**	**48 017**	**-8 327**	**-14.8**
Aggregate GHG (CO_2 equivalent) adjusted [i]		**50 336**	**47 707**	**-2 629**	**-5.2**

[a] The national estimate has been adjusted by excluding CO_2 emissions from flaring offshore, special waste, and waste combustion and flaring of landfill gas, as they were not considered in the IPCC default methodology.

[b] The following source categories, in addition to industrial processes, are included in the national methodology: oil and gas exploration, oil drilling/leakage, gas terminal, extraction of coal, distribution of gasoline, refinery, petrochemical production, liming in agriculture, waste treatment, use of solvent, and liming industrial waste.

[c] The national estimate has been adjusted by excluding CO_2 emissions not considered in the IPCC methodology, listed in footnote b. The estimate obtained using the IPCC default methodology has been adjusted by excluding sources not included in the national methodology, which are production of lime, and use of soda ash and calcium carbide.

[d] Total CO_2 emissions obtained using the national methodology have been adjusted by excluding emission sources not included in the IPCC: flaring offshore, special waste, waste combustion and flaring of landfill gas, oil and gas exploration, oil drilling/leakage, gas terminal, extraction of coal, distribution of gasoline, refinery, petrochemical production, liming in agriculture, waste treatment, use of solvent, and liming industrial waste. The value obtained with the IPCC default methodology has been adjusted by excluding emission sources not considered in the national methodology: production of lime, and use of soda ash and calcium carbide.

[e] An emission range was given by the Party, from 42 to 78 Gg, using both the highest and the lowest emission factor from the interval given by the IPCC. This table shows CH_4 emissions from the IPCC method using the lowest emission factor.

[f] The emission estimate for waste obtained using the national methodology has been adjusted by excluding CH_4 emissions from industrial waste, as the IPCC methodology does not include this source category.

[g] The estimate for total CH_4 emissions obtained using the national methodology has been adjusted by excluding CH_4 emissions from industrial waste, waste combustion and flaring offshore, as these emission sources are not included in the IPCC methodology. Total CH_4 emissions obtained using the IPCC methodology have been adjusted by excluding emissions from 'production of other chemicals' as they are not included in the national methodology.

[h] Total N_2O emissions calculated with the national methodology include 5.2 Gg N_2O from the production of nitric acid (fertilizers), which have not been estimated with the IPCC methodology for 1996. An adjustment has been made by excluding this source from the estimate obtained with the national methodology. Total N_2O emissions include emissions from human sewage, accounting for 0.36 Gg with both methodologies.

[i] Sum of the adjusted total for each gas.

Table 4.A. Range of differences in annual estimates obtained using national and default methodologies, and differences in the trend over the period 1990 to 1996: Norway

Gas	Sector	Range of differences in the period 1990 to 1996 [a]		Trend over the period 1990 to 1996 in per cent		
		Full mass (Gg)	Per cent	National method	IPCC default	Difference[b]
CO_2	Fuel combustion: reference approach	1 177 to 4 890	4.2 to 18.1	15.5	16.4	0.9
	Fuel combustion: sectoral approach	-1 434 to -815	-5.1 to -3.0		17.2	1.7
	Fuel combustion (sectoral approach) adjusted [c]	38 to 308	0.1 to 1.1	16.7	17.2	0.5
	Non-combustion (industrial processes and other)	-860 to 143	-11.3 to 2.0	10.0	2.1	-7.9
	Non-combustion: adjusted [c]	-213 to 161	-3.5 to 2.6	7.3	9.9	2.6
	Total	-2 055 to -828	-5.1 to -2.3	14.4	14.1	-0.3
	Total adjusted [c]	-175 to 309	-0.5 to 0.9	14.9	15.8	0.9
CH_4	Fuel combustion	-10 to -8	-50 to -47	23.5	22.2	-1.3
	Fugitive: oil and gas	6 to 15	25 to 80	60.0	55.6	-4.4
	Coal mining	same method	0			
	Enteric fermentation	-9 to -3	-9.6 to -3.4	6.9	7.2	0.3
	Manure management	-5 to -2	-31 to -20	6.7	9.1	2.4
	Total livestock	-9 to -7	-8.3 to -6.7	6.9	7.4	0.5
	Waste	-130 to -80	-55 to -42.6	17.3	-7.8	-25.1
	Waste adjusted [c]	-40 to 10	-27 to 12.7	44.1	-7.8	-51.9
	Total	-225 to -190	-47.8 to -43	9.7	5.6	-4.1
	Total adjusted [c]	-135 to -90	-28.4 to -20.2	15.5	5.6	-9.9
N_2O	Fuel combustion	-2.7 to -1.5	-89 to -84	28.5	10.7	-11.8
	Agricultural soils	2.1 to 2.9	22.3 to 27.8	0.4	3.7	3.3
	Total	-6.1 to -3.6	-53.2 to -	-1.6	3.3	3.9
	Total adjusted [c]	-0.2 to 0.8	-1.6 to 2.2	10.3	3.3	-7.0
Aggregate GHG (CO_2 equivalent)		-8 327 to -6 486	-15.0 to -12.8	11.7	12.0	0.3
Aggregate GHG adjusted [c]		-2 629 to -1703	-5.6 to -3.8	14.6	13.4	-1.2

[a] A positive difference denotes that estimates obtained with the IPCC default methodology are higher than those obtained with the national methodology, both in annual estimates and in trends.

[b] Results given in this column present the difference between the trend (in per cent) obtained using national methodologies and the trend (in per cent) using IPCC default methodologies, expressed as percentage points.

[c] The national estimate has been adjusted by excluding CO_2 emissions from flaring offshore, special waste, and waste combustion and flaring of landfill gas, as they were not considered in the IPCC default methodology.

[d] The national estimate has been adjusted by excluding CO_2 emissions not considered in the IPCC methodology, namely: oil and gas exploration, oil drilling/leakage, gas terminal, extraction of coal, distribution of gasoline, refinery, petrochemical production, liming in agriculture, waste treatment, use of solvent, and liming industrial waste. The estimate obtained using the IPCC default methodology has been adjusted by excluding sources not included in the national methodology, which are production of lime, and use of soda ash and calcium carbide.

[e] Total CO_2 emissions obtained using the national methodology have been adjusted by excluding emission sources not included in the IPCC: flaring offshore, special waste, and waste combustion and flaring of landfill gas, oil and gas exploration, oil drilling/leakage, gas terminal, extraction of coal, distribution of gasoline, refinery, petrochemical production, liming in agriculture, waste treatment, use of solvent, and liming industrial waste. The value obtained with the IPCC default methodology has been adjusted by excluding emission sources not considered in the national methodology: production of lime, and use of soda ash and calcium carbide.

[f] The estimate for waste obtained using the national methodology has been adjusted by excluding CH_4 emissions from industrial waste, as a methodology for this waste is not included in the IPCC methodology.

[g] The estimate for total CH_4 emissions obtained using the national methodology has been adjusted by excluding CH_4 emissions from industrial waste, waste combustion and flaring offshore, as these emission sources are not included in the IPCC methodology. Total CH_4 emissions obtained using the IPCC methodology have been adjusted by excluding emissions from "production of other chemicals" as they are not included in the national methodology.

[h] Total N_2O emissions obtained with the national methodology have been adjusted by excluding emissions from the production of nitric acid (fertilizer), as this source category has been estimated with the IPCC methodology only for the years 1990 and 1991. For the sake of consistency, this adjustment has been made to all years considered here.

[i] Sum of the adjusted total for each gas.

Table 5.A. Comparison of GHG inventories obtained using national and IPCC default methodologies: Switzerland, 1996

Gas	Sector	Emissions estimate in Gg		Difference	
		National method (sectoral approach)	IPCC default (reference approach)[a]	Gg	%
CO_2	Fuel combustion	41 300[b]	42 209	909	2.2

[a] An estimate using the reference approach but applying default CORINAIR emission factors was also provided, giving 41 325 Gg CO_2.

[b] Value reported in the national 1996 GHG inventory.

Remarks:

For estimating CO_2 emissions from the *energy* sector, Switzerland followed a sectoral approach using the CORINAIR methodology and its default emission factors, since for CO_2 these are practically identical to values measured in Switzerland. For estimating CO_2 emissions from *energy* using the IPCC default methodology, the reference approach with its default conversion and emissions factors has been applied. A national emission factor has only been used for natural gas.

Switzerland also provided an estimate for CO_2 from the energy sector by using the IPCC reference approach but applying national and CORINAIR default emission factors, which gave an estimate of 41 325 Gg CO_2. For this Party, there was practically no difference between the results obtained with the sectoral approach and those obtained with the reference approach if the same emission factors were applied.

Table 6.A. Comparison of GHG inventories obtained using national and IPCC default methodologies: United Kingdom, 1996

Gas	Sector	Emissions estimate in Gg		Difference	
		National method	IPCC default	Gg	%
CO_2	Fuel combustion reference approach	557 466			
	Fuel combustion sectoral approach [a]	543 880	522 346	-21 534	-4.0
	Fugitive fuel emissions	7 488	0		
	Industrial processes [a]	11 703	25 745	14 042	120
	Waste	378	0		
	Total [b]	**563 451**	**548 091**	**-15 359**	**-2.7**
	Total adjusted [c]	**555 585**	**548 091**	**-7 494**	**-1.3**
CH_4	Fuel combustion	93.5	75.9	-17.6	-18.8
	Solid fuels (coal mining)	338	334	-4.8	-1.4
	Oil and natural gas	462	472	10	2.3
	Fugitive fuels emissions	800	806	6	0.8
	Industrial processes	0.7	7.5	6.8	971
	Enteric fermentation	940	955	15	1.6
	Manure management	124	129	5.7	4.6
	Agriculture	1 064	1 085	21	2.0
	Solid waste (landfill)	1 720	1 894	174	10.1
	Waste water	34.0	34.3	0.3	0.9
	Waste	1 754	1 929	175	10.0
	Total	**3 712**	**3 903**	**91**	**5.1**
N_2O	Fuel combustion	20.5	11.4	-9.1	-44.6
	Industrial processes	70	61	-9.7	-13.7
	Manure management	5.07	6.53	1.5	28.8
	Agricultural soils	93.2	118.4	25.2	27.0
	Agriculture	98	125	26.7	27.1
	Waste	0.2	0.5	0.3	132
	Total	**189**	**197**	**8**	**4.2**
	Total adjusted [c]	**189**	**196.5**	**7.5**	**4.0**
Aggregate GHG (CO_2 equivalent)		**699 993**	**691 124**	**-8 869**	**-1.3**
Aggregate GHG (CO_2 equivalent) adjusted [c,d]		**692 127**	**690 969**	**-1 158**	**-0.2**

Table 6.A. (continued)

Gas	Sector	Emissions estimate in Gg		Difference	
		National method	IPCC default	Gg	%
HFCs (actual)	Industrial processes [c]	2.150	2.144	-0.006	-0.3
PFCs (actual)	Industrial processes [c]	0.079	0.078	-0.001	-1.3
SF_6 (actual)	Industrial processes [c]	0.035	0.041	0.006	17.1

[a] An explanation for the differences resulting from the use of the two methodologies in the energy/industrial processes sectors can be found on page 2 of the submission from the Party which was distributed to the participants during the workshop.

[b] The Party also considered emissions/removals from the *land-use change and forestry* sector in its estimates, but for consistency purposes this sector has been excluded from the comparison.

[c] Adjustments made by the Party have been applied, which exclude from the national total obtained using the national methodology the sources offshore oil and gas and waste incineration because they are not included in the default inventory.

[d] Emission estimates from human sewage have been excluded from the default inventory as this source is not included in the national inventory.

[e] Estimates for potential emissions were also provided by the Party, but have not been presented in this table because they are the same for both inventories.

Table 7.A. Range of differences in annual estimates obtained using national and default methodologies, and differences in the trend over the period 1990 to 1996: United Kingdom

Gas	Sector	Range of differences between the national and the IPCC methodologies in the period 1990 to 1996 [a]		Trend over the period 1990 to 1996 in per cent		
		Full mass (Gg)	Per cent	National method	IPCC default	Difference [a,b]
CO_2	Total (reference approach) [c]	10 400 to 18 400	1.9 to 3.3	-3.0	-3.1	-0.1
	Total (sectoral approach) adjusted [d]	-7 500 to -3 500	-1.4 to -0.6	-3.1	-3.7	-0.6
CH_4	Fuel combustion and other [e]	-11 to -7	-11.8 to -7.1	-11.3	-16.2	-4.8
	Oil and natural gas	-213 to 11	-42.5 to 2.3	-7.8	64	72
	Coal mining	-4 to 3	-1.4 to 1.0	-58.7	-59.1	-0.4
	Total livestock	21 to 47	2.0 to 4.4	-2.4	-3.1	-0.7
	Waste (landfill)	174 to 317	10.7 to 16.7	-9	-14.2	-5.2
	Total	125 to191	2.8 to 5.1	-16.4	-14.5	1.9
N_2O	Industrial processes	-9.7 to 5.0	-13.7 to 5.7	-26.3	-35.1	-8.8
	Agriculture	26 to 32	25.5 to 33.0	-5.8	-3.8	1.9
	Total	8 to 27	4.3 to 14.8	-12.1	-14.7	-2.6
Aggregate GHG (CO_2 equivalent) adjusted [f]		**-1 009 to 8 062**	**-0.1 to1.1**	**-5.6**	**-6.2**	**-0.5**
Industrial processes [g]	HFCs	-5.5 to 1.1 per cent		105	102	0.3
	PFCs	6.0 to 57.2 per cent		-74.2	-61.7	-12.5
	SF_6	15.4 to 21.2 per cent		45.4	45.2	0.2

[a] A positive difference denotes that estimates obtained with the IPCC default methodology are higher than those obtained with the national methodology, both in annual estimates and in trends.

[b] Results given in this column present the difference between the trend (in per cent) obtained using national methodologies and the trend (in per cent) using IPCC default methodologies, expressed as percentage points.

[c] In order to take into account in the comparison only those sources included in the reference approach, national total CO_2 emissions given here include only CO_2 emissions from fuel combustion plus sources involving fuel consumption in solid fuel transformation, iron and steel, and ammonia production.

[d] Adjustments made by the Party have been applied, which exclude from the national total obtained using the national methodology the sources offshore oil and gas and waste incineration because they are not included in the default inventory. [e] "Other" includes emissions from industrial processes and waste incineration.

[f] Aggregate GHG emissions have been calculated on the basis of total CO_2 emissions estimated with the sectoral approach. The national estimate has been adjusted by excluding emissions from offshore oil and gas and waste incineration because they are not included in the default inventory.

[g] Only estimates for actual emissions were given in this table since potential emissions are the same for both inventories.

Table 8.A. Comparison of CH_4 emissions from agriculture using the IPCC default methodology and two national methodologies carried out by the IPCC-OECD-IEA Programme for National Greenhouse Inventories[a] for Australia and the United States of America

Australia, 1990					
Gas	**Sector**	**Emission estimate in Gg**		**Difference [b]**	
		National method[c]	**IPCC default**	**Gg**	**%**
CH_4	Enteric fermentation	2 814	2 627	-187	-6.6
	Manure management	78	283	205	263
	Total livestock	2 892	2 910	18	**0.6**
United St ates, 1990					
CH_4	Enteric fermentation	5 710	5 496	-214	-3.8
	Manure management	2 600	1 480	-1 120	-43.1
	Total livestock	8 310	6 967	-1 343	**-16.2**

[a] "Comparison of methane emissions from agriculture using IPCC default methodology and two national methodologies", Pierre Boileau, OECD Secretariat, IPCC-OECD-IEA Programme for National Greenhouse Gas Inventories.

[b] Results given in this table slightly differ from those given in the IPCC-OECD-IEA submission as the secretariat used another approach for estimating the differences between methodologies, setting the national estimates at 100 per cent.

[c] Data reported to the UNFCCC as at 15 May 1998.

Remarks:

The Australian inventory also considers emissions from buffalo, ostriches, emus, alpacas and deer, which are not considered in the default IPCC methodology. For CH_4 emissions from manure, the estimates are significantly different, indicating considerable differences between the methodologies. Since much of the manure generated by Australian beef cattle is voided on pasture, the national methodology assumes these degrade aerobically and therefore produce little or no CH_4 emissions, which is reflected in the Australian emission factors. This information is not considered in the default IPCC methodology. However, overall CH_4 emissions from livestock differ by only one per cent, indicating, initially, that in the case of Australia the methodologies are comparable.

For the United States the results for enteric fermentation do not differ significantly. This is due to the fact that the FAO, which provides the activity data for the IPCC methodology, obtains animal population statistics from national Governments. Moreover, several of the emission factors used are the same for the two methodologies. For manure management the differences are mainly a result of higher emission factors in the United States methodology for certain types of cattle, pigs and poultry.

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